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ORIGINAL ARTICLES

INSTANCES OF OPERATIVE CORRECTION OF MAL-RELATION OF THE JAWS.*

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IN all cases of mal-relation of the jaws developing during the growing period, that are not due to some trauma or disease of the bone itself, the first recognizable sign is a mal-occlusion of the teeth. Whether this mal-relation of the teeth is the primary cause, or is itself dependent upon some less noticeable skeletal defect, will not be considered in this presentation. I shall start by accepting mal-occlusion as either the primary cause or an early symptom. After certain forms of mal-occlusion are once established, no matter how slight, their further development may be augmented by the mal-application of force in which the bones, the teeth and the muscles are all concerned. If this mal-application of force is allowed to continue throughout the growing period, this of itself may produce extreme deformity that cannot be corrected by orthodontic appliances. It is with the correction of such advanced cases, together with deformities resulting from mal-union of fractures, unreduced dislocations, early loss of bone from disease, deformity due to scar contraction, and from early ankylosis that this paper will deal.

In operating, the surgeon must not attempt impossibilities nor be misled by false issues. Occlusion, normal or abnormal, is the result of pressure and counter-pressure, of growth and apposition, and can seldom be perfectly established simply by two bone cuts. The real issues ordinarily at stake are facial outline (which includes both the profile and the lateral breadth) and the ultimate occlusion, while immediate occlusion is a secondary consideration. To do his work correctly, it is absolutely necessary that the surgeon shall have at least a theoretical knowledge of the scope and limitations of orthodontic operations and some conception of the mechanics of occlusion.

*From an illustrated talk given before the Alumni Society of the Dewey School of Orthodontia, Kansas City, Mo., February, 1915.

Artists have formulated laws of correct facial outline that will further guide us in this work. (1) The septo-labial angle should be ninety degrees. Exceptions to this are the case of the overhanging Roman and the retroussé nose, where it may be greater. (2) The lower lip should not protrude beyond the upper. (3) The distances between the hair line and the root of the nose, between the root of the nose and the sub-nasal angle, and between the latter and the tip of the chin should be about equal. None of these rules however, are absolute, and a badly deformed face may be much improved without attaining perfection.

In the operations to be described we have to deal with an upper cuboidal jaw and a lower one that is a hoop of bone capable of almost any kind of adjustment; and it is upon the latter that our efforts must be expended. It must have occurred to almost every thinking observer that it would be easy to correct the open bites and under-hung jaws if one could but cut through the bone that carried the nerve and blood supply to the teeth. The ultimate result of such a cut was the cause of much contention among orthodontists for years, and a fear of necrosis or non-union of the fragments held them in check, without reason, it has now been shown. Ununited fracture of the lower jaw is rare, and in the whole of the "Surgeon General's Index" there is not reported a single case in English, German or French literature of necrosis or loss of teeth from sections of the body or ramus; yet this is a recognized procedure for ankylosis. Esmarch recommended the removal of a section from the horizontal ramus for this trouble because of the liability of the bones re-uniting after simple section; and this is the method advised in the standard text books of even today. Finally, besides the operations I have done, such sections of the mandible have been done by at least one surgeon in England and a number have been operated upon in this country. In only one reported case has necrosis followed, and that was at the site of the cut—due, I believe, to local infection. We need not concern ourselves with the consequence of cutting the inferior dental nerve and artery. Normal sensation eventually returns to the teeth after their section.

The position of the upper jaw in different individuals is not uniform, but whatever it may be, it is a fixed one. On the other hand, both the position and the shape of the lower jaw may be changed by operation, therefore it is convenient in a surgical classification of types of mal-relation between the jaws to regard only the position and shape of the mandible, protrusion, retraction, lateral displacement, etc., but in planning operation, the relation of both jaws to the facial outline must be considered.

Protrusion of the mandible, judging from the cases that I have observed, may be due to either the abnormal size of the mandible compared to the maxilla, or to a forward position of the body of the mandible, or to a combination of these two factors.

Probably all of you have observed cases in which there is a wide inter-dental spacing in the inferior premolar region with a corresponding or even greater mandibular prognathism (Fig. 1*a*).

Fig. 2 shows John Hunter's idea of the development of the jaw, which though it may not be absolutely correct, is probably sufficiently accurate to illustrate the origin of these inter-dental spaces.

The point I want to call attention to is, that in the normal development of the lower jaw the growth seems to be chiefly at the posterior edge of the ramus, at the posterior border of the coronoid process, at the epiphyses of the condyle, on the surface and borders of the body. Concomitant with the growth in the length of the ramus and growth of bone on the posterior border of the ramus, you have an absorption on the anterior border of the ramus and the anterior border of the neck which allows the ramus to march backward or the body forward, and gives length to the body of the jaw bone.

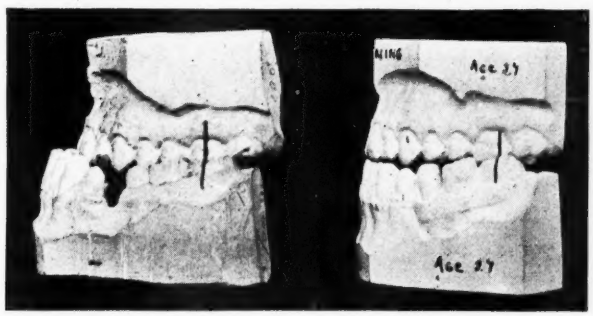


Fig. 1*a*.

Fig. 1*b*.

Fig. 1*c*.

Fig. 1*a*.—Shows protrusion of the lower jaw due partly to the interdental space between the molars and partly to a sliding forward of the body as a whole.
Fig. 1*b*.—Shows the result obtained by operation.
Fig. 1*c*.—Made to illustrate a more ideal adjustment for the case in Fig. 1*a*.

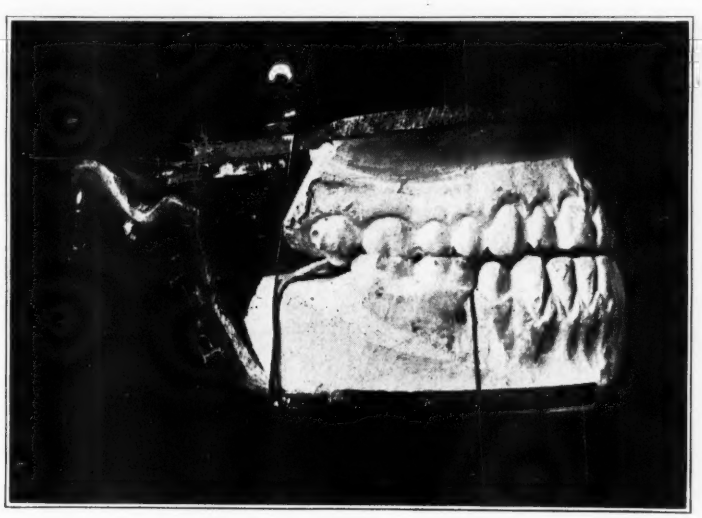


Fig. 1*d*.—Angle's idea of treating the case in Fig. 1*a*.

Now, the position of the original deciduous molars is occupied eventually by the premolars which require much less space than the molars. That extra space which was occupied by the molars is supposed to be taken up in the adult jaw by the greater width of the cuspids, these being pushed backward, and also by the molars traveling forward.

In a lower jaw in which the body is of a length corresponding to the space required for the teeth, as the deciduous molars are cast off and the permanent erupt, there is a movement of the cuspids backward and of the molars forward, by which the premolar space is filled up. Just for the

sake of argument, if you will grant that an individual, through heredity or any other way you choose to put it, would develop a body of the jaw bone that was larger than was necessary for the teeth which it is to contain, then it would not be necessary for the cuspids to move distally, nor the molars mesially; they would find room without migration (Fig. 2), and it seems to me that is a possible explanation for a certain class of cases of protrusion of the lower jaw in which you find an inter-dental space of considerable size, always, as far as I have been able to make out, in the cuspid or bicuspid

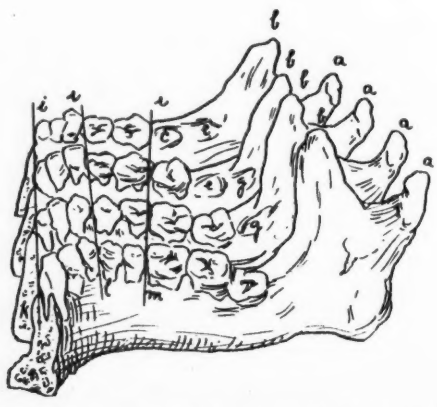


Fig. 2.—Diagram by John Hunter, illustrating the normal growth of the mandible. It will be seen that the bicuspid teeth occupy less space than did the deciduous molars which they replace. The extra space is used partly by the permanent cuspids and partly by the first permanent molars moving forward. If the teeth are not crowded into this space, bicuspid interdental spaces may result.

Fig. 3.—Dissection of jaw of young child showing space between the last occluding molars and the ramus of the jaw.

region. In all of the jaws with these inter-dental spaces that I have seen, there was or had been a full quota of teeth in the mandible, in some cases supernumerary teeth were present.

In a second class of cases of mandibular prognathism the two dental arches are about of a corresponding size but the lower as a whole is in a mesial position compared with the upper. This may be due to one or more of

several factors. Later I will show a skull in which retraction of the body is mostly due to a comparative shortness of the mandibular ramus, and X-ray and casts demonstrating that a unilateral shortening of one ramus will cause a retraction of the body on that side. It is conceivable that protrusion of the type under consideration might be due to or is accompanied by a comparative over-growth in the length of the ramus, either primary or acquired (Fig. 3).

The history of all these cases shows that the deformity is progressive, and a study of the anatomy of the developing mandible suggests that a gradual opening of the angle between the body and the ramus with a primary or secondary lengthening of the latter may be the cause of this forward progression of the body. As a change in the angle may be either a contributing cause or a result, a careful study of this angle and the factors which control it is opportune. During the period of complete permanent dentition the angle of the jaw, as a rule, is about one hundred degrees. In youth and extreme old age this angle is greater. From youth to adolescence these

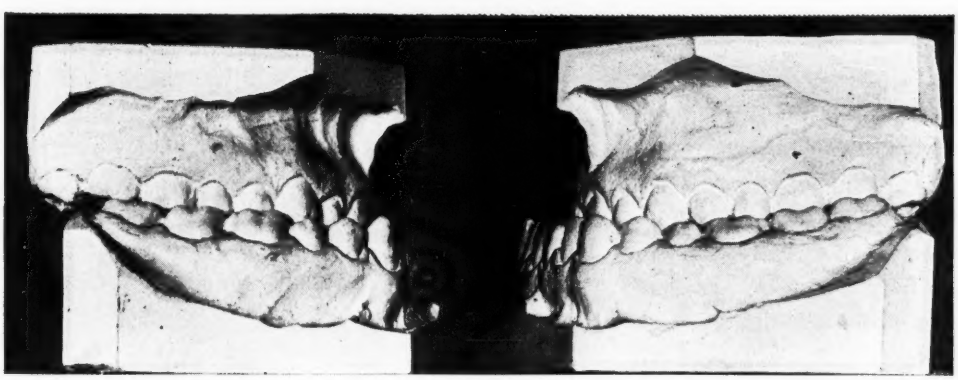


Fig. 4*a*. Fig. 4*b*.

Fig. 4*a* and *b*.—Shows a mandibular protrusion in which the dental arches are of about corresponding size, the protrusion being due to a forward position of the body. (After Lischer.) The case treated by the splint, shown in Fig. 8*a*, was of the same character.

changes are accompanied by a deposition of bone, in old age by a process of absorption, though in childhood the bone may be bent in any part. At birth the body of the mandible is straight and rests squarely against the maxilla. From the cutting of the first incisors until the third molars are in occlusion there is a space distal to the occluding teeth which is an unsupported arch upon which most of the power of the internal pterygoid and masseter muscles is expended (Fig. 3). These tend to draw the lower end of the ramus forward and upward, to increase the angle and to push the body forward. The bone of a growing lower jaw is not normally called upon unaided to resist the action of the masticatory muscles, nor is it capable of doing so. If during this period the inferior incisors are not firmly locked behind the superior, we have the beginning of forward protrusion which, if unresisted artificially, will result in an under-shot jaw (Fig. 4).

As abnormal premolar inter-dental spaces bring the lower incisors into mesial occlusion so that they are not locked behind the uppers, it is natural that when these spaces are present there should also be a sliding forward of the mandibular body as a whole, which was present in the cases I have ob-

served (Fig. 1*a*). A forward position of the condyle either from an unreduced dislocation (See Fig. 28), or acquired by habit, as in one skull shown to me by Dr. Cryer, will account for a few.

Before operating upon my first case of mandibular protrusion, I carefully considered the best site of attack. It would be a natural procedure for a simple forward position of the body of the mandible to make a cut in the ramus and push the jaw back to its proper relationship, but the fear of crowding the retro-ramal structures and thus possibly to interfere with free opening, decided me to remove a section from the body itself, a procedure I have adhered to in all the cases of mandibular protrusion upon which I have operated. However, simple section at or above the angle was later advocated by Dr. Babcock of Philadelphia and has been used several times.

Fig. 1*a* shows a case in which there was both inter-dental spaces and a sliding forward of the body as a whole; the history of this case is that he had this space on each side from the time he lost his first molars, but the protrusion of the lower jaw continued to increase during the entire period of growth, which I take it, was partly due to a continuous sliding forward of the body. As long as this picture is on the screen I would like to mention that this was, I think, the first of these cases ever operated upon. This operation was done in December, 1897.* The result (Fig. 1*b*) was obtained not only by taking out a section of bone on each side and setting back the mental piece, but the premolar teeth had to be crowned to bring them into occlusion, because the lower incisors were brought just under and not into distal occlusion with the uppers. This was done before Angle ever announced his I, II, III, classification.

Fig. 1*c* shows the plan I would adopt now in the preceding case. This is the reconstruction of a cast in which instead of bringing these incisor teeth just touching the superiors, the upper incisors are supposed to have been moved forward and to allow the lower incisors to obtain their normal occlusion behind the upper incisors. That would be more correct orthodontic procedure and would lessen a now too great sub-nasal angle. Fig. 1*d* shows Dr. Angle's idea of treating the same case. This would give a much better occlusion than I obtained, but it also disregards the sub-nasal angle.

Fig. 5*a* and *b* shows another of these inter-dental space cases. Incidentally, it has three incisors on the right side. The body as a whole was so far forward that this man could shut his mouth without having the lower teeth touch the upper in any place (Fig 5*c*). The correction was made by taking out pieces of bone on either side from the body, and as you see, as time advanced, this being a later case, we got a little better orthodontic result (Fig. 5*d*). But in neither cases nor in any of these cases would I have moved the mental fragment of the lower jaw back to what might be considered normal occlusion. I will show you why. Fig. 5*e* and *f* shows the result of operation in the case shown in Fig. 5*a*, *b*, *c*, and *d*. Much of the strength of the man's face lies in his chin. It would be very easy, if one were not to be guided by the facial lines, to take away too much chin and give the man a weak face.

In the first case (Fig. 1*a*), the bone was taken away by removing parallelograms of bone with a double-bladed saw and adjusting the fragments.

*Interstate Medical Journal, Vol. 13, No. 9, 1906.

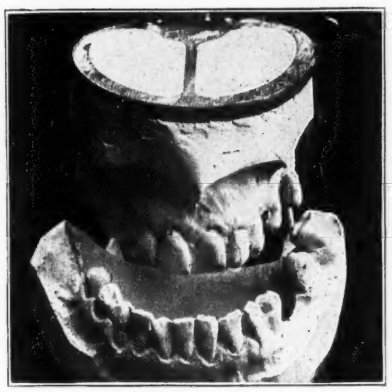


Fig. 5*a*.

Fig. 5*b*.

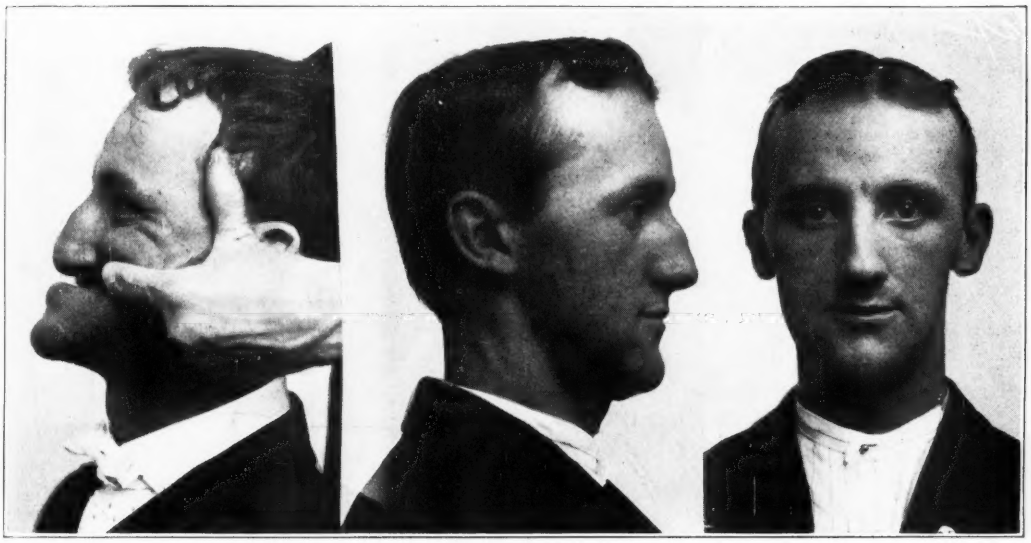


Fig. 5*c*

Fig. 5*e*.

Fig. 5*f*.

Fig. 5*d*.

Fig. 5*a* and *b*.—Shows extreme protrusion due to interdental spaces and forward position of the body.

Fig. 5*c*.—Showing the profile of Fig. 5*b* with the upper lip drawn back and the jaws "closed" as far as the soft tissues will permit. This position was obtained without pushing the condyles forward.

Fig. 5*e* and *f*.—Fig. 5 after operation.

Fig. 5*d*.—Showing adjustment obtained in Fig. 5*a* and *b* by submucous resection of the body.

In the case shown in Fig. 5, wedge-shaped pieces were removed as was advocated by Angle for the first case, which partially accounts for the better adjustment in this one.

In taking the section of bone out with a double- or single-bladed flat saw, the incision extends through the mucosa and a necessarily infected wound results. But every fracture of the body of the jaw results in an infected wound and these always heal. The case shown in Fig. 5 was operated by sub-periosteal resection which is illustrated in Fig. 6. For either operation the incision is made along the border of the lower jaw opposite the site at which the piece of bone is to be removed. If a tooth has been removed, the gum must be thoroughly healed before sub-periosteal operation is done. For the sub-periosteal resection, the soft tissues, not including the periosteum, are dissected from the buccal and lingual surfaces of the bone on each side as high up as the base of the alveolar process; from here up the periosteum is also elevated so that the alveolar bone is bared but the oral cavity is not opened. Leaving the periosteum on the body of the bone tends to conserve its vitality should we get an infection. After freeing the muco-periosteum from the upper border of the alveolus, a needle is passed around the body under the periosteum, followed by a wire saw and the

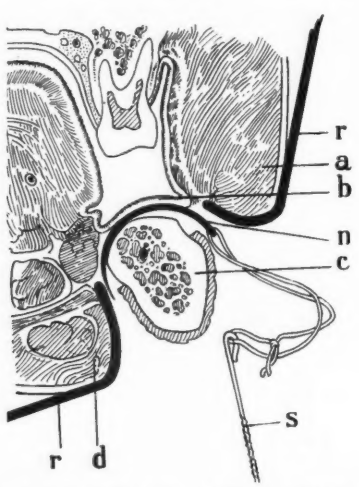


Fig. 6.—Submucous resection of the lower jaw. Coronal section through the body of the jaw and the surrounding tissues. *a*, tissues of the cheek; *b*, mucoperiosteum of the gum raised from the body of the jaw; *c*, body of the jaw, covered with periosteum on its lower part; *d*, submaxillary tissues; *n*, curved needle passing over the body of the jaw; *r*, retractors holding back the cheek and submaxillary tissues; *s*, wire saw, with ring replaced by a sharp bend, attached to the needle by a silk carrier.

section taken out. Technically, the sub-periosteal resection is a little more difficult and to my mind has no real advantage over a through-and-through cut of the bone and its muco-periosteal covering. In either case the skin incisions are made under the border of the body, are less than an inch long and are all but invisible. Fig. 7*a* and *b* is a diagram to show how the adjustment is made after removing these sections from the body.

When the body of the jaw shoots forward, you have a double deformity. Not only are the lower incisors in mesial occlusion with the uppers but a wider part of the lower jaw has been brought in contact with a narrower part of the upper jaw, so that the lower molars have a buccal relationship to the uppers. In correcting this, you not only want to put the chin fragment back, but also to bring the lateral fragments of the jaw lingually.

About the means of fixation of the fragments—one of the first recorded cases in which there was a cutting of the jaw bone to correct a deformity, was a resection of the alveolus by Dr. Hullihen, a dentist in Wheeling, West Virginia, in 1848. He used a continuous swedged metal splint covering the crowns. The various methods of fixing the jaw for fracture have a bearing on the subject.

In a subsequent comment on the first case, Dr. Angle proposed a three-piece dental splint, to be applied before operation, which should be so made that after accurate sections were taken out of the bone, these three pieces could be clamped together and the fragments would be held in the desired position. Personally I would not undertake the removal of such accurate pieces as to count on the splint sections coming exactly into place when I got through, but the idea of a three-piece splint looked good and for another case we modified it in this fashion (Fig. 8*a* and *b*). We allowed for a space between the flanges larger than the section of bone to be taken out,

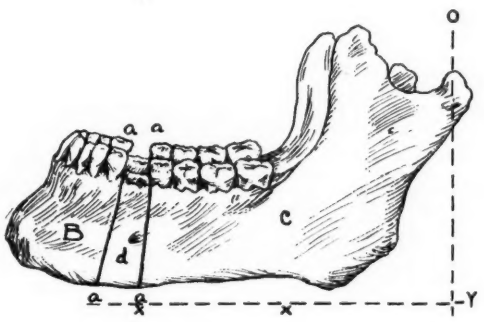


Fig. 7*a*.

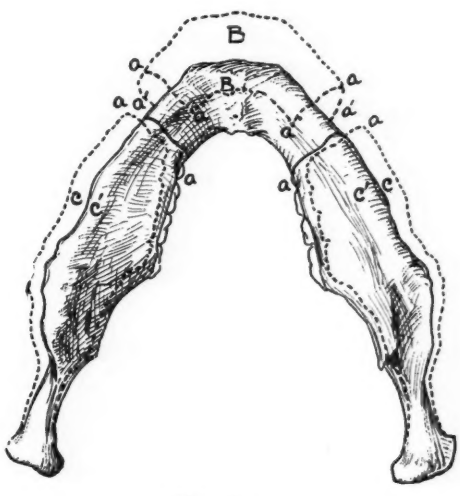


Fig. 7*b*.

Fig. 7*a* and *b*.—Sections of bone of the proper size are removed and the fragments brought together. The cuts are illustrated in Fig. 7*a* by the lines *aa*. *aa* and sections *dd* are removed, then the fragments *cbc* are moved in and back to form the new arch *c'*, *b'*, *c'*, shown in dotted lines. The lateral fragments rotate on an axis corresponding, not to the last molar tooth, but to the temporo-mandibular articulation, *oo*. Now, as the distance from the cut to the last molar, *xx*, is about one-half that from the cut to the axis of rotation, *xy*, the anterior end of the fragment will move in twice as far as does the last molar, which is about in proportion to the usual displacement of the two points. By this operation both the lateral and the forward protrusions are corrected.

then in adjusting the new arch, little wedges of lead where shaped up to fill in the spaces between the flanges and the latter were bolted together. That worked very nicely but, in addition, the inferior border was held with a wire on each side. The use of this splint necessitates a trans-mucous operation.

Fig. 9 shows what is, I think, my favorite way of fixing the fragments;—first, get some dental friend to put bands on appropriate teeth with rings on the bands. A day or so later the operation is done. If the alignment of the teeth is so irregular that I cannot bring them well into apposition, modeling compound is used in places to fill in the occlusion. Both fragments of the lower jaw are wired to the upper jaw and across the cut to each other. I also use one wire at the lower border of the body. Of course these wounds are all drained.

The second broad and more common class of cases of mal-relation of the jaws is a relative retraction of the body of the mandible.

Fig. 10*a* and *b* illustrates the relationship of the temporo-mandibular joint to the occlusal plane. In the infant, the temporo-mandibular joint is just about on a level with the palate, but as the teeth erupt and the alveolar process develops in the upper and lower jaws and the maxillary sinus expands, the body of the lower jaw moves downward. The body can move downward and maintain its proper relationship to the upper jaw only by a proportionate elongation of the ramus which normally takes place. My observation leads

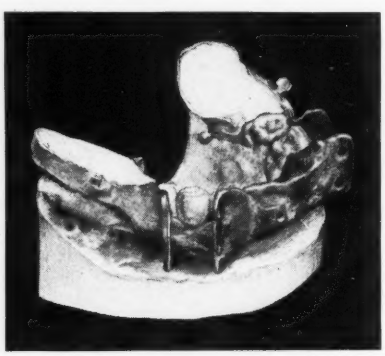


Fig. 8*a*.

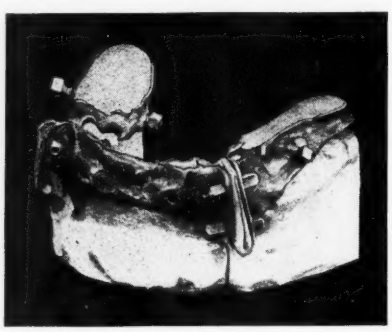


Fig. 8*b*.

Fig. 8*a*.—Lateral view of modified Angle splint, showing flanges drilled for bolts, and also bicuspid teeth that were removed at operation.

Fig. 8*b*.—Angle splint after operation, lateral view. To allow for inaccuracies, the distance between the flanges was made larger than the section of bone to be removed. After operation the space between the plates was filled with a piece of lead plate, beaten and cut to the proper shape.

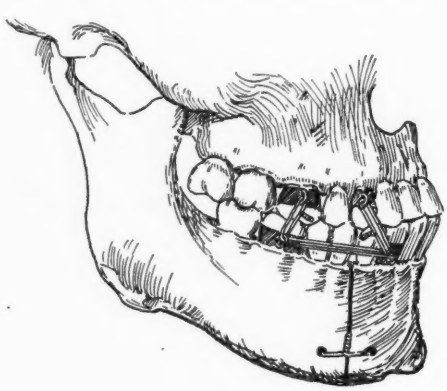


Fig. 9.—Method of fixing the cut mandible by wires and bands.

me to the conclusion that in most cases a relative shortness of the ramus is partly responsible for the retraction of the body of the mandible.

Fig. 11*a* shows a skull with a marked retraction of the lower jaw due mostly to a short ramus, the body and teeth of the lower jaw nearly corresponding to those of the upper, as may be seen in Fig. 11*b*, in which the rami have been cut through and the body pushed downward and forward into a good relationship with the upper jaw.

Fig. 12*a* and *b* shows the profile of this cadaver before and after making the bone adjustment shown in Fig. 11 *a* and *b*.*

*For author's views on the bearing of atavism on occlusion and facial outline, see *Dental Era*, April, 1907; *Surg. Gynec. and Obstet.*, January, 1907.

Passing from the cases of retraction of the mandible which have not demonstrable etiology, for neither mal-occlusion nor a short ramus can be accepted as a primary cause, we will take up those due to bone disease, lack of function, or trauma.

Fig. 13 shows in a striking way the lack of growth of both body and ramus in the absence of teeth. Fig. 14*a* and *b* shows the unilateral lack of growth that occurs where the tooth buds are completely lost on one side,

Fig. 10*a*. Fig. 10*b*.

Fig. 10*a* and *b*.—Showing the change of the relation of the occlusal plane to the joint.

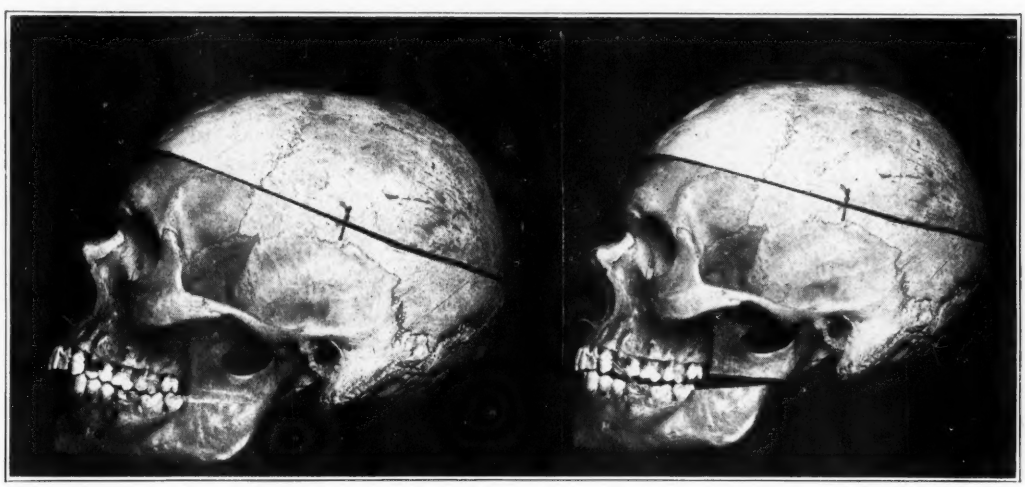


Fig. 11*a*. Fig. 11*b*.

Fig. 11*a* and *b*.—Natural skull illustrating the deformity and the correction in cases of Class II. Note that the deformity is due mostly to a shortening in the ramus. In this skull, however, all of the ventricle diameters, the height of the forehead, the height of the orbit, and the height of the ramus are short in comparison with the transverse diameters, and the maxilla is prognathic. Yet when considered alone the prominence of the nasal bones and the shape of the cranium would place the skull very high in the scale of development. This I take to be an instance of atavism, and the malocclusion an accident dependent upon this atavism.

while Fig. 15 is an illustration that even the loss of a single permanent tooth may be followed by a contraction of the dental arch.

I think the most interesting series of studies I have is in connection with lack of free movement of the temporo-mandibular joint during the growing

period. The earlier the limitation occurred and the more complete, the more marked the resulting lack of growth of the mandible.

Fig. 16 shows the least noticeable retraction but in this case an injury occurred at the age of eleven years and limitation became evident several years later.

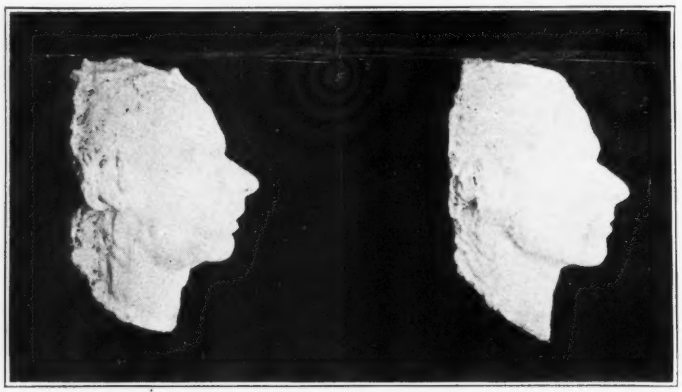


Fig. 12*a*. Fig. 12*b*.

Fig. 12*a* and *b*.—Cadaver from which skull of Fig. 11 was taken. Face before and after bringing forward the lower jaw in a case of Class II.

Fig. 13.—X-ray showing a very much undeveloped jaw of a young woman twenty-two years old, who at the age of three years lost the teeth and a portion of the upper border of the body from necrosis, evidently all of the germs of the permanent teeth except those of the third molars. The latter teeth are seen to be the only ones that have developed. The body of the jaw has developed but little since it suffered the injury. The lower third molar can be seen growing apparently from the ramus.

Fig. 17*a*, *b*, *c* and *d*, show close unilateral ankylosis resulting from gonorrheal arthritis neonatori. The joint was successfully restored three months ago.

Fig. 18*a* shows a child at five years who had a double ankylosis for two years.

In the case shown in Fig. 17, one joint was destroyed, while in the case

shown in Fig. 18, both joints were destroyed. At operation no epiphyses were found in the condyles of these damaged joints. The subsequent development of these cases will be of immense interest.

The single ankylosis case was given a good free motion but was operated on only three months ago. The second case was operated nearly three years ago but the mandibular movement has not been satisfactorily free (Fig. 18*c*). From photographs I have received, I would say that the deformity has not decreased nor has it increased (Fig. 18*b*).

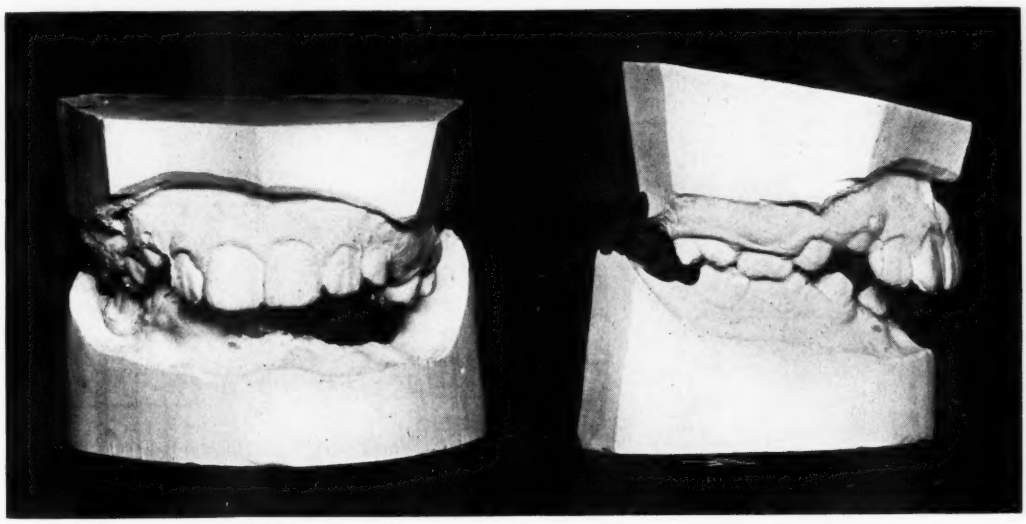


Fig. 14*a*. Fig. 14*b*.

Fig. 14*a* and *b*.—Showing the unilateral growth that occurred between October, 1913, when the necrosis began, and February, 1915, when the cast was made. The child was eight years old when necrosis occurred.

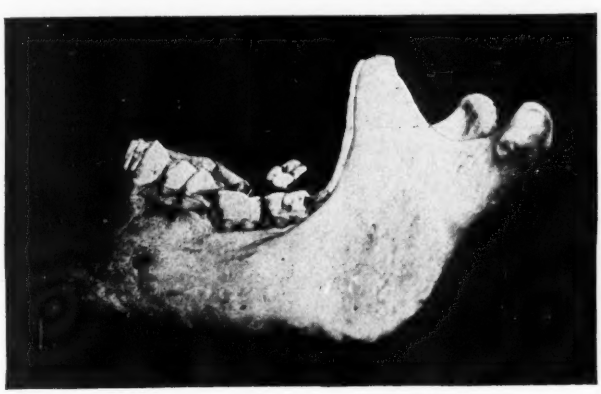


Fig. 15.—Showing deformity of the jaw due to early extraction of the first permanent tooth.

Fig. 19*a* shows broad fibrous ankylosis, gonorrheal in origin, first noticed at three years, becoming increasingly close until sixteen, when X-ray was taken. This and the succeeding X-ray (Fig. 19*b*) demonstrate clearly that at least part of the retraction is due to lack of length in the body itself.

Fig. 20 shows retraction accompanying a limitation of movement, due apparently to an over-developed styloid process. In this case what movement existed was so free as to preclude an intrinsic joint derangement.

The means of correction of extreme retraction of the mandible consists essentially of cutting the ramus above the angle and bringing the body forward.

In the case shown in Fig. 13, I offered to attempt to graft a piece of rib in each side after resecting the bone at the angle, but without any enthusiasm, and the offer was rejected.

Fig. 16.—Partial ankylosis due to injury at eleven years and becoming noticeable several years later. It has caused little noticeable retraction.

In simple retraction of the jaw, sub-cutaneous resection of the rami (Fig. 21) and drawing the body forward as far as possible (Figs. 20 and 22), leaves no noticeable scar and gives acceptable results (Fig. 23 and Fig. 24*a* and *b*). These may be further improved by transplanting a piece of cartilage into the chin (Fig. 25*a* and *b*.)

Where retraction of the mandible has developed in the presence of a single ankylosis the diseased joint is reconstructed* and if the second permanent molar is completely erupted, the ramus is resected on the other side and the body brought and held forward as described above. If the second molars are not fully erupted the joint is reconstructed but the resection of the other ramus is postponed. If the retraction accompanies a double ankylosis then both joints are restored and, if possible, the jaw is at the same time brought forward and wired in this position.

Surgery, Gynec. and Obstet., October, 1914, pp. 436-451.

Fig. 17*a*.

Fig. 17*b*.

Fig. 17*c*.

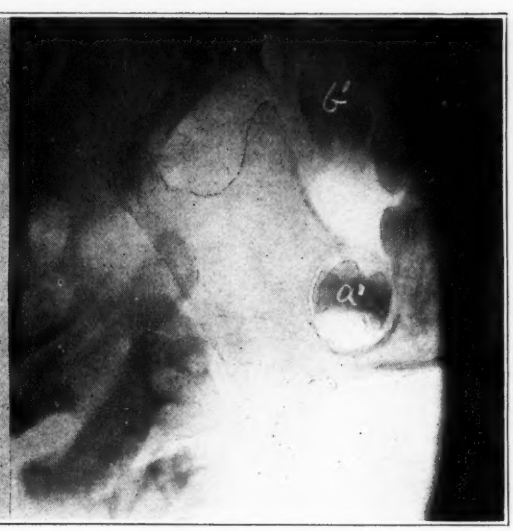


Fig. 17*d*.

Fig. 17*a*, *b*, *c* and *d*.—Profile and X-rays of child three years old who had gonorrheal arthritis at birth resulting in an ankylosis on the left side. Fig. 17*c* shows the left ramus and damaged joint. Notice that the developing 6th-year molar (*a'*) is in the ramus and completely distal to the 6th-year molar in the upper jaw (*b'*). On this side the ramus in the X-ray measured only 5 cm. in its greatest length, while in Fig. 17*d*, the uninjured side, the relationship between the upper and lower 6th-year molars is about natural and the ramus measures 6 cm.

Fig. 17*b*.—Shows a lateral deviation of the chin to the left corresponding to the shorter ramus on that side.

Fig. 18*a*.—Close fibrous ankylosis at 5 years, which resulted from an injury at 3 years.

Fig. 18*b*.—Case of Fig. 18*a* one year after operation.

Fig. 18*c*.—Case shown in Figs. 18*a* and 18*b*. In this case the ankylosis was bilateral.

Fig. 18*c*.

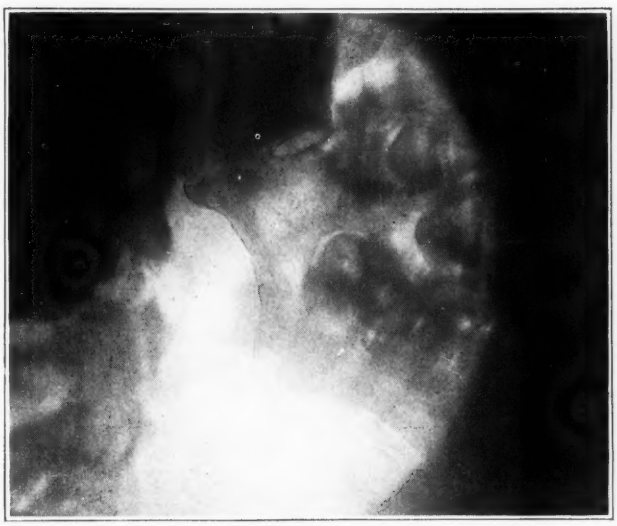


Fig. 19*a*.

Fig. 19*a*.—Broad close fibrous ankylosis of the right side. Length of the ramus on the X-ray measures 40 mm., while in Fig. 19*b*, the undamaged side, the ramus is 52 mm. The right lower first premolar occluded squarely with the upper second premolar, while on the left side, the unankylosed side, with the longer ramus, the lower first premolar occluded between the first and second upper premolars. The molars held corresponding relations which is a strong suggestion that the position of the body is influenced by the length of the ramus. The chin also deviated to the right.

Fig. 19*b*.

In the case shown in Fig. 18 an attempt to bring the jaw forward was abandoned for fear of fracturing the rather delicate bone.

In case Fig. 20, the ramus was resected on both sides and the jaw dragged forward and wired in this position for twelve weeks. In doing this the angle was moved away from the impinging styloid process and this allowed fairly free opening. A lateral displacement is to be corrected by resecting the body or ramus as indicated in the particular case (Fig. 26*a* and *b*.) Fig 25*a* and *b* is a fair example of what may be accomplished.

In the case shown in Fig. 14, and in some similar ones I have under observation, I shall resect the ramus on the affected side after the second molar is fully erupted.

Fig. 20.—X-ray of a case of retraction of the mandible apparently due to limitation of movement. From the movement present it was concluded that the limitation was due to one angle striking some object and it was operated upon this theory. Both rami were cut and the body dragged forward at the same time carrying the angle away from the supposed obstruction. Some years later, the X-ray having reached greater perfection, this plate demonstrated that the obstruction was an over-developed styloid, which is here emphasized in the illustration and marked *S-S*. The cut in the ramus is still plainly to be seen and also the forward position of the angle *A*.

Traumatic cases are treated on similar lines.

A third classic type of mal-relation of the jaws is the open bite. Dr. Federspiel has just called my attention to the term *mandibular curvature*. I like this term because it corresponds to my conception of the pathology. Independently, Dr. Lischer and I have both concluded that the primary etiologic factor in many of these cases is rickets which may cause irregular dentition and permits bone distortion. One reason for this conclusion is

that a pitting and malformation of the crown of the permanent incisors is frequently present (Fig. 29*a*). This is supposed to be characteristic of severe rickets. My second reason for believing that severe mandibular curvature in certain cases might be due to rickets is founded upon the following hypothesis, which, as far as I have observed, fits in with the clinical facts. In severe rickets the bones, for a time, become so abnormally soft

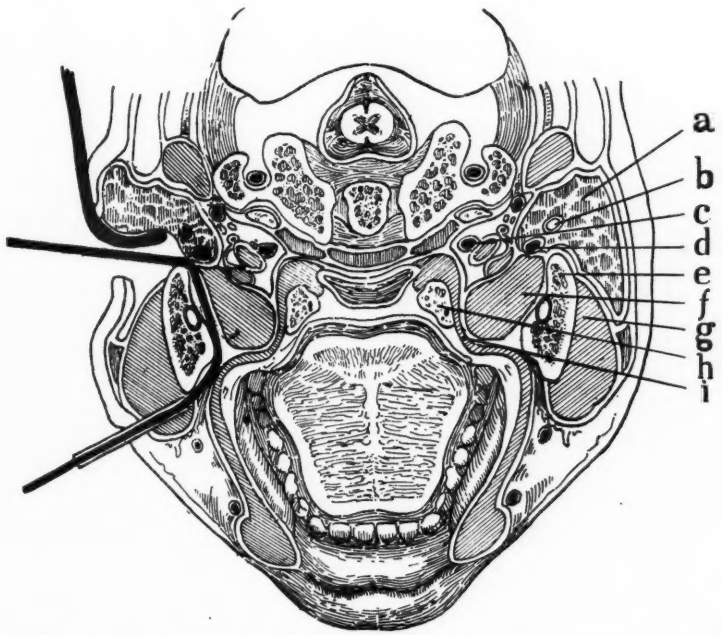


Fig. 21.—Transverse section of the face at the level of the occlusal surfaces of the molars. On the left is shown the wound through the skin and fascia. The parotid gland is drawn back with a retractor, and the wire saw is seen passing around the ramus and out through the cheek. Where it emerges, the skin of the cheek is protected by passing the saw through a thin metal tube. On the right are indicated: *a*, parotid gland; *b*, temporo-maxillary vein; *c*, internal carotid artery; *d*, external carotid artery; *e*, ramus of the jaw containing the inferior dental nerve and vessels; *f*, internal pterygoid muscle; *g*, masseter muscle; *h*, tonsil; *i* wall of pharynx.

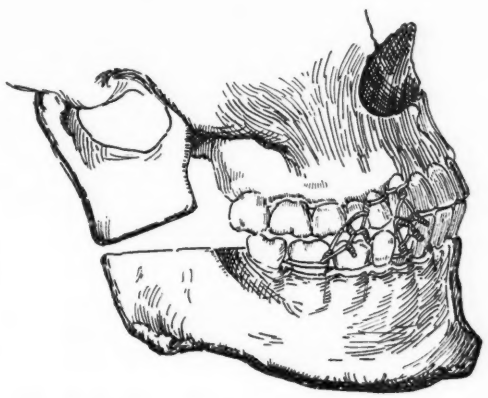


Fig. 22.—Showing jaw wired in its new position after section of the ramus.

that they bend and become distorted by normal muscular pull and weight-bearing pressure. The results of this bony softening and distortion cause classic deformity in the legs, arms, pelvis and chest. The active stage of the disease may last some months and acquired distortions are not entirely corrected with the subsequent hardening and growth of the bone. Some

very severe deformities may persist. Granting that in a given case of rickets occurring in the second year the lower jaw participated in the general softening of the bones and that the crowns of the lower deciduous incisors occluded behind and were overlapped by the uppers so that the body as a whole could

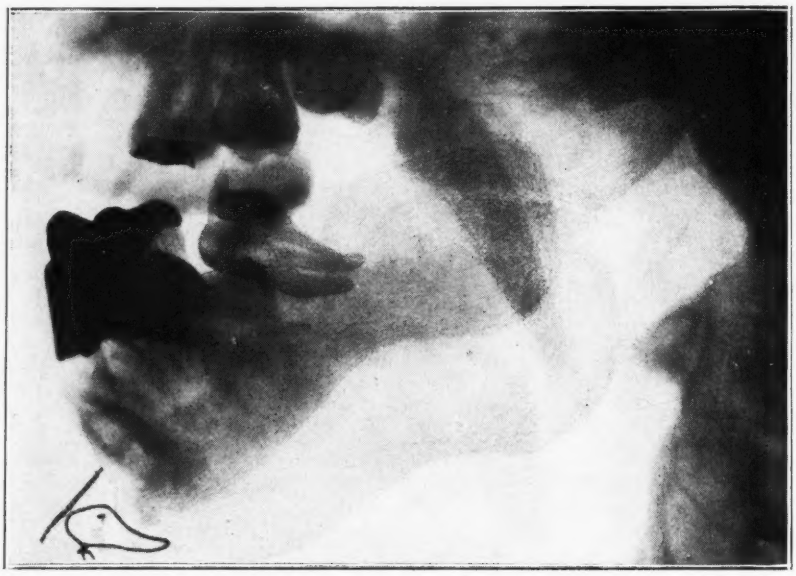


Fig. 23.—X-ray showing condition of the ramus some time after section. Notice the obliquity with which the part of the ramus above the saw cut meets the lower portion. In this case there was no operation performed on the ankylosed joint, and on that side there is only a fibrous union between the divided parts of the ramus. Later this union became so close that it was necessary to excise the ankylosed joint. The nail and wire at the chin were used to hold a piece of costal cartilage in place.

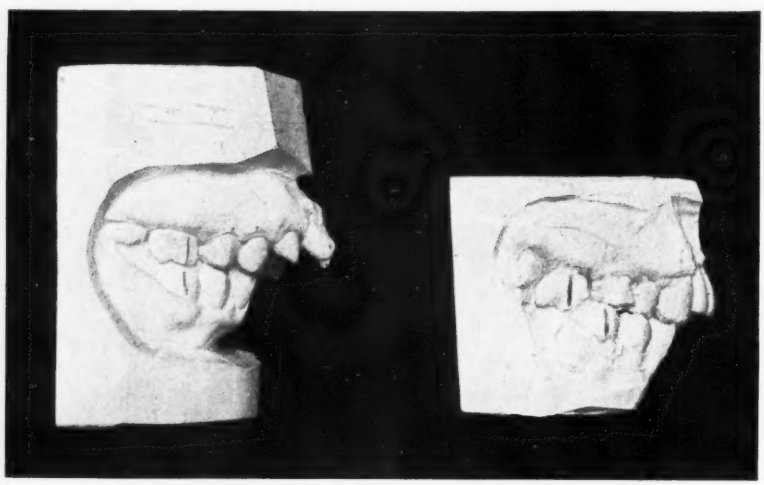


Fig. 24*a*. Fig. 24*b*.

Fig. 24*a* and *b*.—Casts taken before and after operating on case shown in Figs. 19*a* and 19*b*, and in Figs. 25*a* and 25*b*.

In Fig. 24*b*, the protruding incisors have been amputated and the crowns adjusted at a more appropriate angle.

not slide forward, it is well within the observed phenomena of rickets to suppose that the posterior, unsupported part of the body (Fig. 3) would bend upward to the pull of the muscles of mastication and that it would

Fig. 25*b*.—Case shown in Fig. 25*a*, eight months after first operation which included the transplantation of a piece of costal cartilage in the chin. She has an opening of 22 millimeters, has gained considerably in weight, and her general appearance and mode of dress show her improved disposition.

Fig. 25*a*.—Shows girl of 16 years, in whom, as a result of an infectious arthritis, there was an almost complete fibro-osseous ankylosis of the right side—first noticed at three years. At sixteen years she had an opening of 3 millimeters on the right and of 4 millimeters on the left in the cuspid region. The right condyle was excised and a new joint made. The left ramus was sawed in two, and the body dragged forward and wired in its position. Later a piece of her seventh costal cartilage was implanted in front of the mental part of the body of the jaw. Shortly after unwiring the jaw she had an opening of 18 millimeters.

harden in this abnormal shape. Then when the 6th year molar erupted it would be at a higher level than the premolars and would prevent these latter teeth from coming in contact with the uppers. Rickets usually occurs in

Fig. 26*a*.

Fig. 26*b*.

Fig. 26*a*.—Showing deviation of the chin, which may occur with retraction of the jaw, due to limitation in motion where the obstruction is unilateral.

Fig. 26*b*.—Case shown in Fig. 26*a*, after operation. The chin has been placed symmetrically.

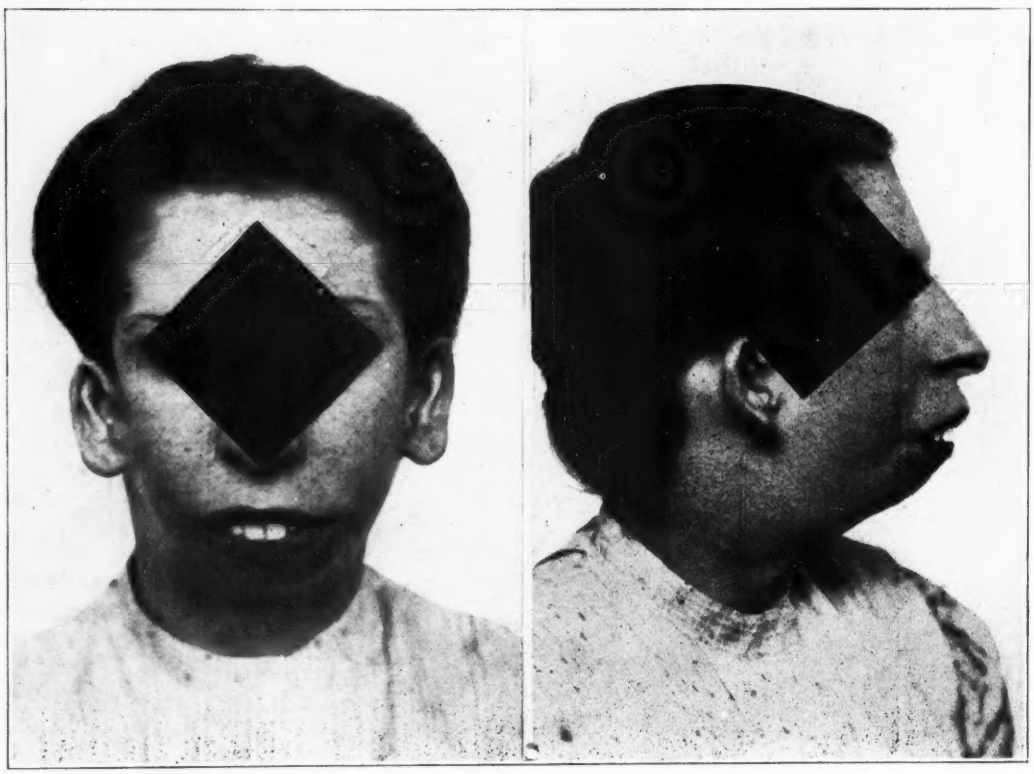


Fig. 27*a*.

Fig. 27*b*.

Fig. 27*a* and *b*.—Retraction of the mandible accompanying a branchial fistula of the first clefts.

the first two years, is rare after the fourth year but may occur later. It is probable that cases of open bite developing with some such habit as thumb sucking, the use of a "pacifier", etc., are due to the habit plus concur-

rent rickets. In such cases the open bite would develop during the habit period and not at some later time.

Fig. 29*b* shows an X-ray of a very extreme case of open bite operated at fifteen years. On examination it was found that the second molar on each side was in occlusion and that the teeth mesial to those were not. Just in front of the angle there is a sharp downward curve of the body well shown in the skiagraph. A straight line drawn along the lower border of the body would be a cord to this curve and would meet the posterior border of the ramus at a very obtuse angle. Part of the extreme open bite of this case was due to the lack of development of the crowns and alveolar

Fig. 28.—Protrusion of the mandible due to an unreduced dislocation on one side. The condyle is outlined in black (marked *C*) and may be seen lying in front of the articular eminence (marked *E*) and surrounded by a white dotted line. The lower third molar may be seen to occlude with the upper first and second. This protrusion was entirely relieved and free movement of the jaw restored by removing the dislocated condyle.

process of the upper incisors which might also be a direct result of rickets. The correction of this was the most difficult and the least satisfactory of any case of jaw deformity I have undertaken. The mandibulo-hyoid muscles were short, powerfully developed and strongly resisted the change in position of the mental part of the jaw. The tongue was so large that it almost filled the mouth before operation and had difficulty in accommodating itself afterward.

A pre-operative study of the skiagraph showed that the anterior part of the mandible could be elevated by removing a V-shaped section, base at the alveolar border, at the site of the retained deciduous molar but this

would shorten the jaw considerably and contract the oral cavity more than the over-sized tongue would permit. A curved cut could be made through the posterior end of the body, concavely forward on a radius from the first

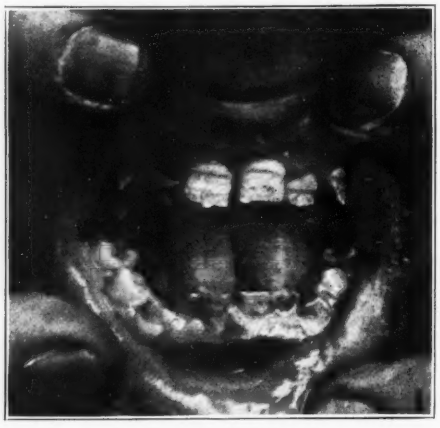


Fig. 29*a*.—Open bite in a young negro boy showing rachitic malformation of the teeth.

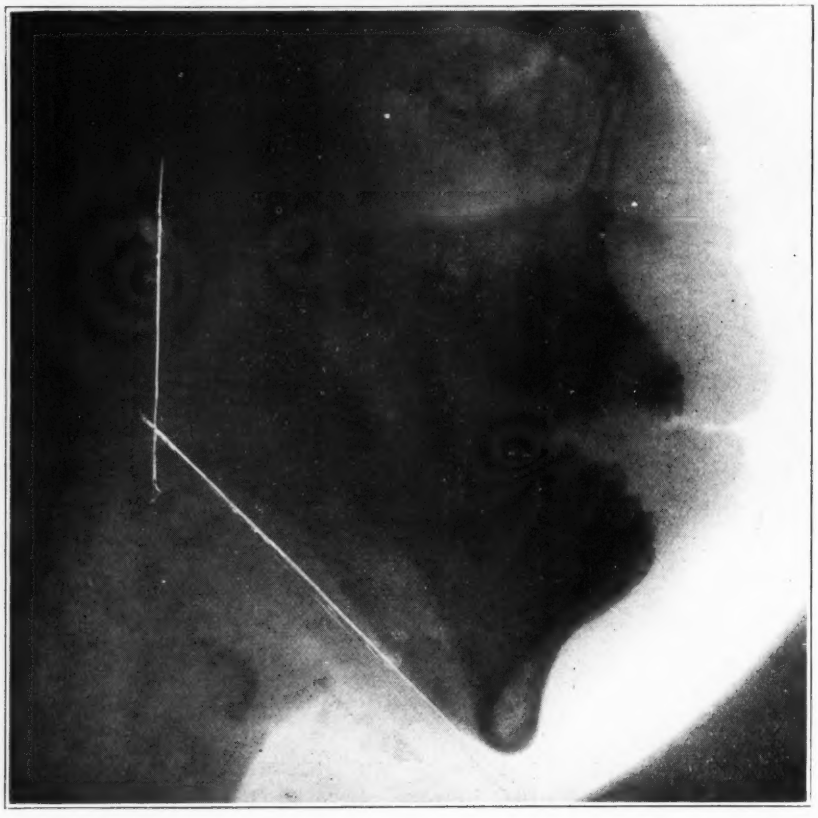


Fig. 29*b*.—Showing the bending downward of the body in a case of extreme open bite of supposed rachitic origin and the abnormally large angle formed between the body and the posterior border of the ramus.

occluding tooth, but adjusting the incisor open bite by this bone cut would cause an almost equally objectional lack of molar occlusion. The most promising cut for this case is shown in Fig. 29*c*, which was the cut used, the

bone spaces to fill in by deposition. Little difficulty was encountered in making the cuts but the pull of the mandibulo-hyoid muscles pulled it back to its original position. Resort was then made to a modified Gunning splint which depressed the posterior fragments rather than elevating the anterior

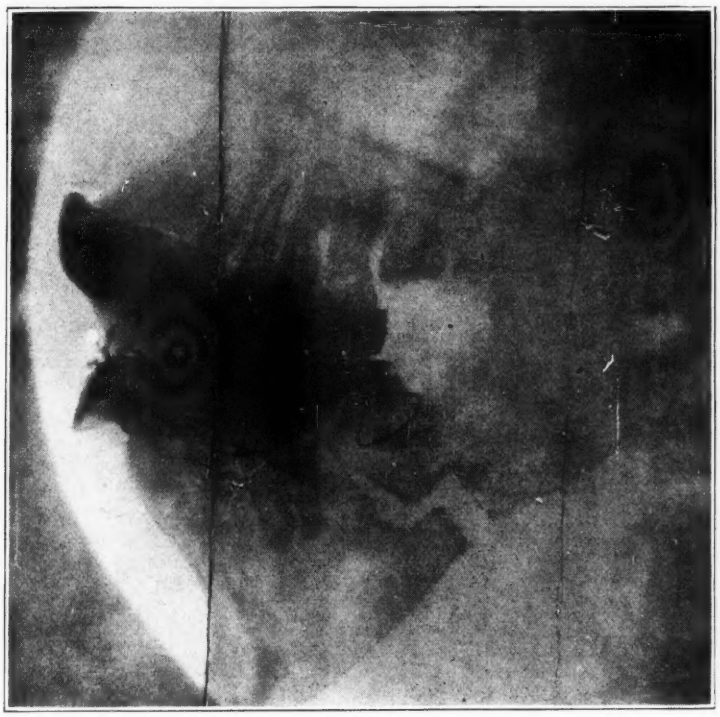


Fig. 29*c*.—Shows the method used in elevating the anterior part of the body after making a sinuous cut in case 29*b*. The open spaces were left to fill in with bone deposit but, were I to repeat this operation, I would insert a bone graft in each side or use a direct fixation splint, a Lane plate fastened with screws. The mouth was dressed open with a modified Gunning splint which is here shown in place.

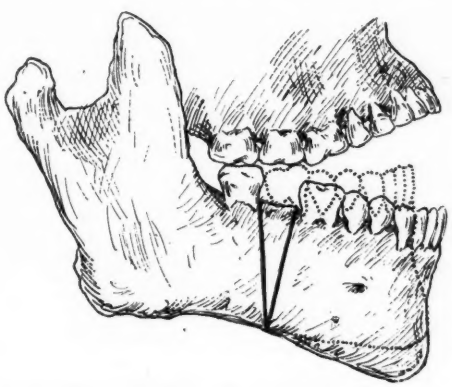


Fig. 29*d*.—Open bite of an extreme type in a young man, showing how correction might be made by a V-shaped excision. This would have the disadvantage of shortening the jaw considerably, as shown in the reconstructed jaw indicated by dotted lines.

(Fig. 29*c*). This worked fairly well but did not correct that part of the open bite due to the upward tilt of the upper incisor alveolus.

I report this particular case at length for it is the most pronounced jaw deformity I have seen.

The case shown in Fig. 31 was much easier but here the open bite was from the cuspid region forward (see legend under Fig. 31).

Open bite due to mal-union of fracture of the mandible when severe enough to require correction is as a rule restored by cutting the bone at the sites of fracture and using adequate fixation.

The case shown in Fig. 32*a* and *b*, is of particular interest because of the extreme mal-position of the lower jaw and because there had been a transverse fracture of the upper jaw that had healed by ligamentous union. After freeing the mal-union of the lower jaw it was wired to the upper teeth by means of dental splints but the ligamentous union of the upper jaw yielded slightly to the muscular strain exerted through the lower. When the confining wires where removed the maxilla gradually returned to its place,

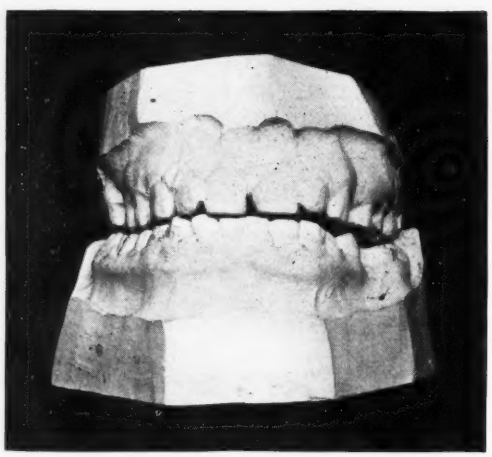


Fig. 30.—Interdental spacing acquired in adult life due to recent growth of the maxilla. An acromegalic. The interdental spacing is as frequently found in the lower arch due to growth of the mandible.

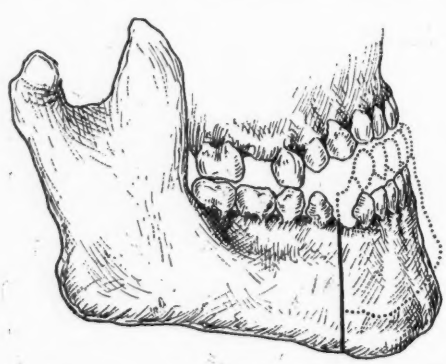


Fig. 31.—Is made from a plaster cast of an open bite but the outline of the bones are supplied. The history of this case is peculiar. The deciduous molars crumbled very early, down to the necks and it is possible that the open bite may have been related to this early loss of the molar crowns.

leaving a certain amount of mal-occlusion shown in Fig. 32*d*, and this in spite of the use of an elastic chin bandage in addition. This difficulty could not have been overcome by a Gunning splint as was the over-strain in the case shown in Fig. 29, because the fractures were behind the last molars and there would have been no control of the posterior fragment. A subsequent report from the patient states, that with the persistent nightly use of the elastic chin bandage, the teeth have come up to a good occlusion.

Contracting intra- or extra-oral scar bands also cause jaw deformities and mal-relations but time will not permit taking up these at present.

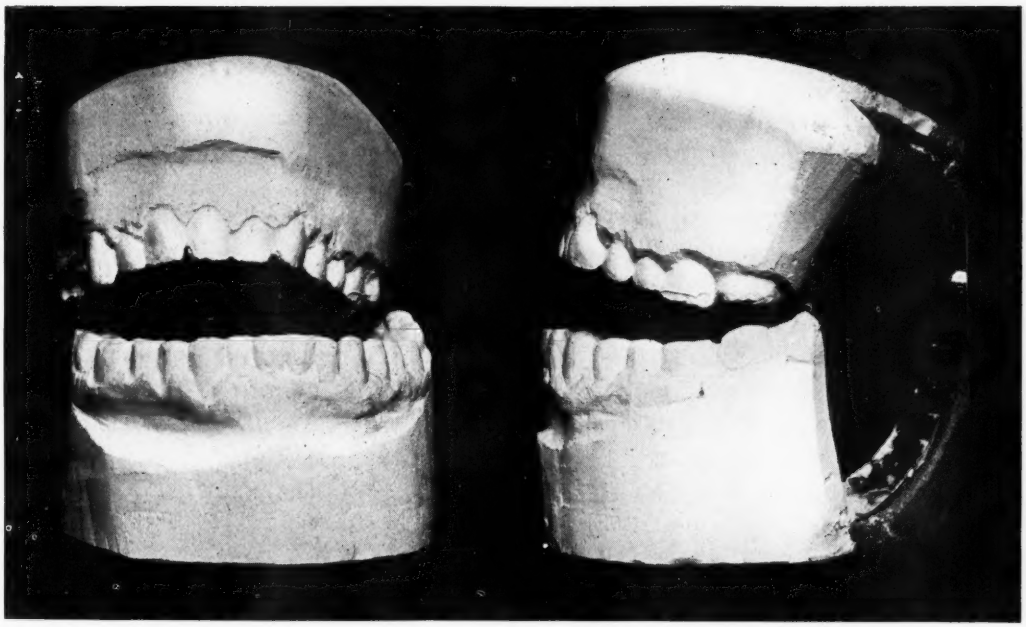


Fig. 32*a*. Fig. 32*b*.

Fig. 32*a* and *b*.—Show cast of a case of mal-union of fracture through the rami near the angles. The fracture had been neglected because of other serious injuries that it was believed would prove fatal.

Fig. 32*c*. Fig. 32*d*.

Fig. 32*c* and *d*.—Show the occlusion in case shown in Fig. 32*a* and *b*, and the result of a double resection of the rami at the sites of fracture and wiring the jaws together. The loss of one eye and a fracture of the nose, not yet corrected, are shown in the pictures.

These observations are based upon operations of twelve cases of jaw deformity and a considerably larger series of unoperated cases.

The illustrations were not selected with the idea of demonstrating a series of results, which I would like to have done did space permit, but were confined to those that seemed appropriate to the points cited.

A number of the illustrations used in this paper were taken from the author's book on "Surgery and Diseases of the Mouth and Jaws" published by The C. V. Mosby Company of St. Louis.

REPORT OF CASES TREATED WITH DR. EDWARD H. ANGLE'S NEW APPLIANCE.*

By A. H. Ketcham, D.D.S., Denver, Colorado.

IN offering the report of these cases a preliminary word of explanation is necessary. My object is to make use of them as a means of proving to you the possibilities, in a new method of correcting malocclusion, brought out by Dr. Angle and described by him in two articles in the *Dental Cosmos*, one in the issue of August, 1912, and the other in that of January, 1913. The time limit of this paper will not permit of any attempt on my part to give a careful and logical description either of the appliances or of the technique in their use, nor is this necessary, for Dr. Angle has given a careful and painstaking description, not only of the appliances, but of their application and operation, such as only their inventor could give. I will therefore assume that you are familiar with the *Cosmos* articles in question, and, if you are not, let me advise you to study them most thoroughly. This is necessary, for while this method offers decidedly greater possibilities for atttaining the ideal than any of the various other methods that have been brought out, it also imposes deeper and more thorough study, and the development of proportionately greater skill in technique. Yet the skill and judgment necessary for the successful employment of this method is only such as the specialist in orthodontia should possess or attain by practice.

Here permit me to give a word of encouragement to those who are just beginning to use the new method. Almost everything new that we attempt seems at first more or less difficult, yet the same thing becomes so easy as to be done almost unconsciously after we become thoroughly accustomed to it. I feel sure that all who are as keenly interested in the success of our beloved specialty as the members of your Society must be, are not only willing, but anxious to do all that is within reason towards making themselves more useful and proficient in its practice. I fully agree with Dr. Angle in the enumeration of the advantages of this method over his former method which he knew so well, when he says: "Instead of tipping the crowns of the teeth into the line of occlusion and leaving the roots at abnormal angles of inclination, to be adjusted by nature during the period of retention, the teeth should be moved bodily, as a result of force so gently and so evenly distributed as to stimulate normal cellular activity and the growth of bone. In other words, the work of the orthodontist should be the intelligent assisting of nature in her process of developing bone, thus making it possible for her to normally build the denture in its entirety." Also this: "That tooth movement is performed more easily, more satisfactorily, and with better results when very gentle pressure, rather than pronounced force is employed."**

Case No. 1.—The first case in its original condition of malocclusion presented no remarkable or unusual peculiarities, but only such problems as you are all familiar with and meet in practice almost daily (Figs. 1*a* and

*Reprinted from the Transaction of the European Orthodontia Society, Sixth Annual Meeting, London, May 11 to 14, 1913. Edited by Oester-Ungar. Vierteljahrsschrift fur Zahnheilkunde, Vienna.

**The Dental Cosmos, August, 1912, page 856.

1*b*). The first slide shows this to be a Class I case. You will note that the crowns of the incisors are crowded, overlapping, and that they are protruding while the roots are slanting inward. The patient was a mouth-breather, anæmic, poorly nourished, with the gums in a low condition of vitality, the gingival margins being in a chronic state of inflammation. You can readily picture in your minds the result of treatment of such a case by any of the older methods where the crowns of the teeth are tipped outward, leaving the inclination of the crowns and roots at a most abnormal angle. We have all left them this way in similar cases, as it was the best we could do, for we operated only by tipping the teeth and depended on the

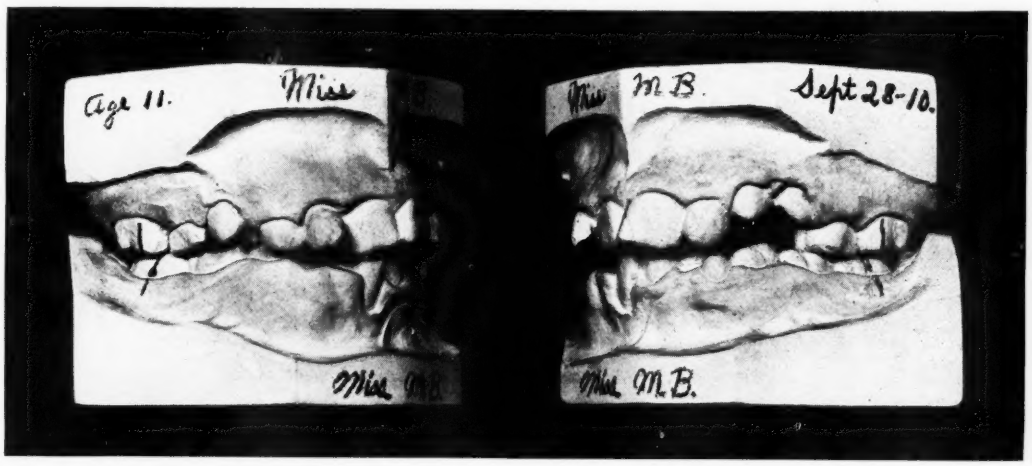
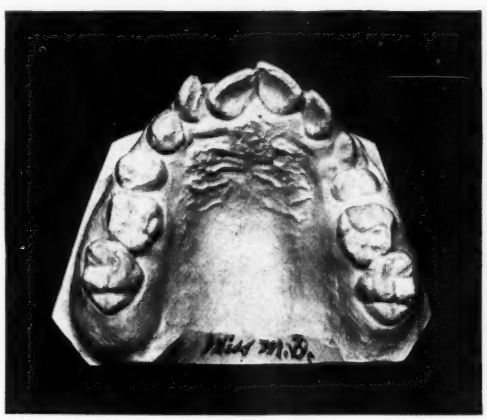


Fig. 1*a* Fig. 1*b*.



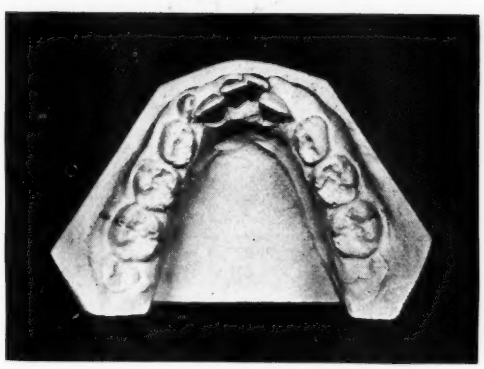


Fig. 2*a*. Fig. 2*b*.

growth forces of bone for the movement of the roots, and the building to proper contour of the alveolus and associated structures. You can recall the inflamed condition of the gum margins in cases of low vitality like this, where arches, ligatures, and other forms of appliances were worn, and where the ligatures or clamps and wire arms rested against gum tissue.

Figs. 2*a* and 2*b* show the lingual surfaces of the models, while Fig. 3 shows the new appliance upon the teeth. The delicate middle section of the arch having been carefully bent to lie in contact with the incisal margins of the central and lateral incisor bands, and is securely attached to the bands by

the delicate pins which telescope with the tubes on the bands—all described in the *Cosmos* articles. Note the neatness of appearance of this appliance; see how easily the teeth may be brushed; also that there is no part of the appliance bearing against gum tissue to cause inflammation; then realize that the great advantage in the use of the new method is, that the required force is distributed to the entire tooth, root as well as crown, in the direction, of the amount, and for the distance we wish. Thus it is possible to fully control tooth movement and at the same time to so gently stimulate the development of the osseous cellular structure as to cause a more rapid growth of the bone in the apical region.

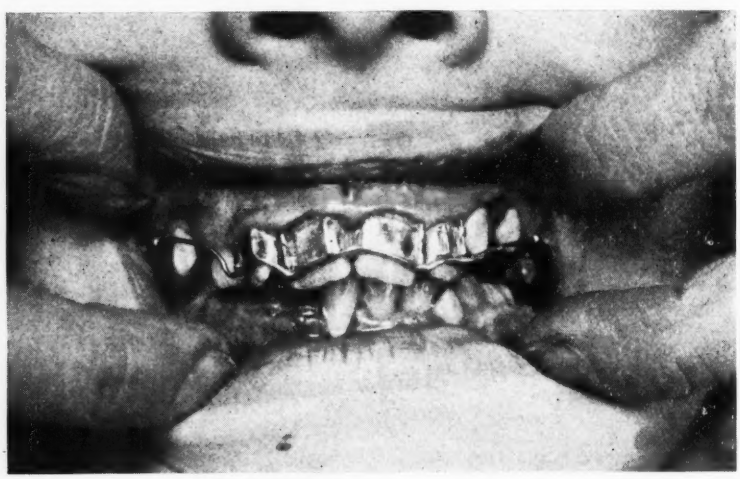


Fig. 3.

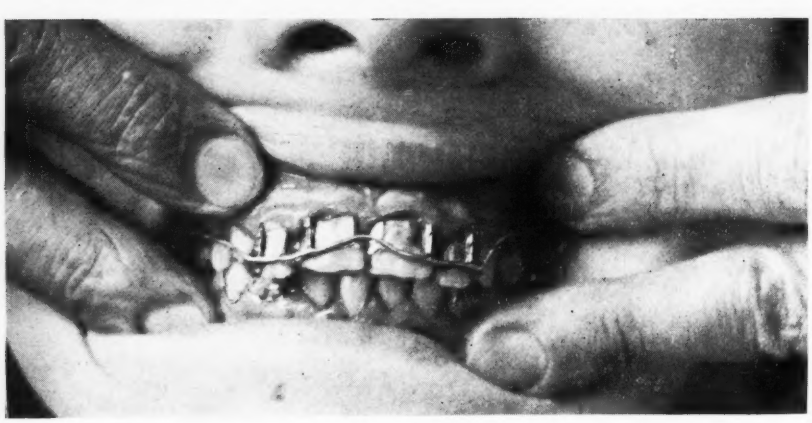


Fig. 4.

This case was one of the first in which the writer used the new appliance from beginning to end of treatment.

Mistakes were made in the technique of construction. Notice the seam on the labial surface of each band. On account of neatness in appearance and less likelihood of unsoldering when attaching tube, the seam should have been upon the lingual side instead of labial. Second, the tube should have been placed near the center of the labial surface of the band, as was discovered while rotating the left lateral incisor. In spite of the operator's efforts the tooth turned until the mesial corner which had been in labial

position assumed a lingual torsion. Third, as the arch wire was straightened a space developed between the central incisors which, however, was corrected by bending the arch upward at this point, as shown in Fig. 4. This also shows the position of the teeth after the appliance had been in place eight months, with adjustments varying from once every two weeks to once a month. Notice that the lateral incisors are too long. This was corrected by bending the arch wire upwards slightly on each side, at a point just distal to the central incisor pins.

After having been worn fifteen months the appliances were removed and simple retainers adjusted. At the end of nine months these were re-

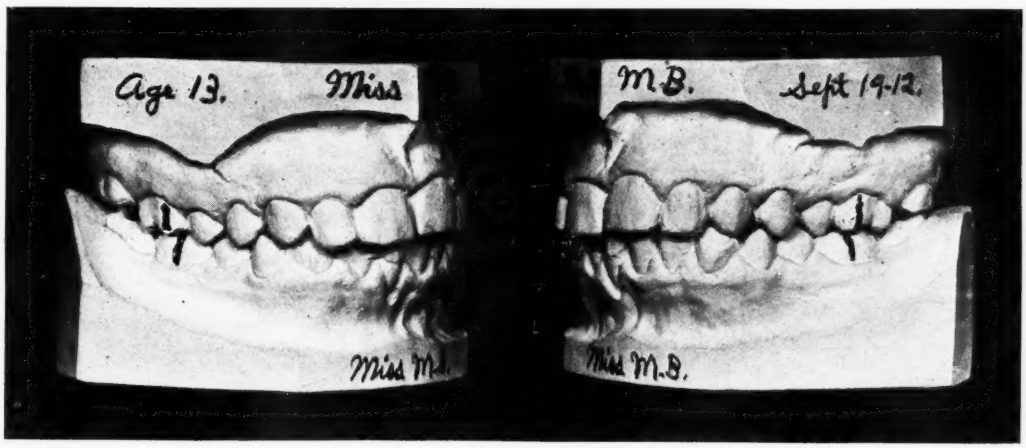


Fig. 5*a*. Fig. 5*b*.

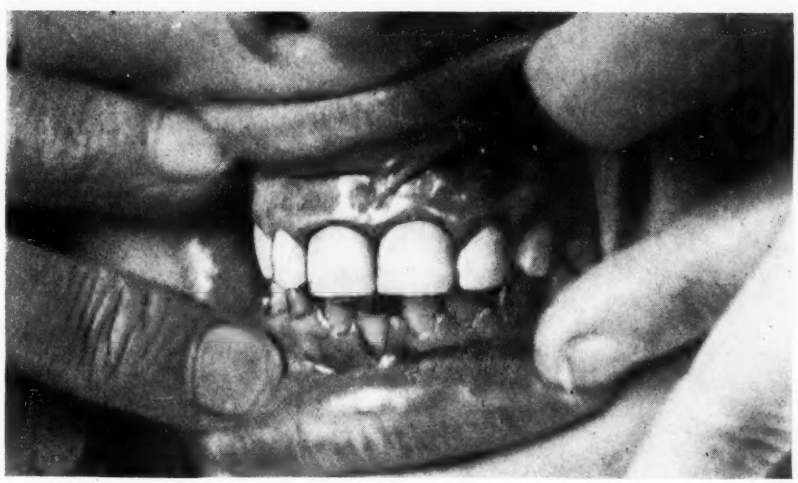


Fig. 6.

moved as the left central incisor was being forced upward. Figs. 5*a* and 5*b* show models of the case at this time. Note that the roots of the upper incisors are in normal labial position, giving normal inclination to the crowns of the teeth. This result was obtained without an attempt being made to move the roots of the teeth faster than the crowns, by bending the pin-tips outward.

The next illustration (Fig. 6) is of a photograph of the mouth and teeth made one month after the models just shown.

It is extremely doubtful whether the roots of the teeth in this case would have come forward unaided on account of lack of normal lip function.

Case No. 2.—(Fig. 7.) This case is somewhat peculiar in that the left upper incisor crowns have a pronounced slant toward the median line, with the root of the lateral very prominent labially. The left temporary canine

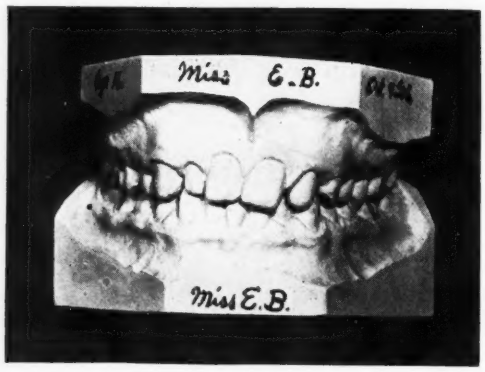


Fig. 7.

Fig. 8*a*.

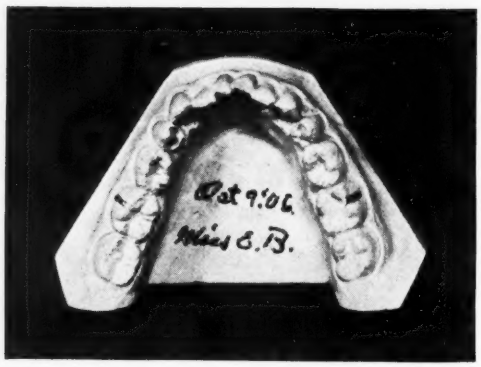


Fig. 8*b*.

Fig. 8*c*.

Fig. 8*d*.

is in place, with the permanent tooth impacted lingually (Fig. 8*a*). The lower second temporary molars are present. The radiograms (Fig. 9*a*) show the positions of the impacted canine and (Fig. 9*b*) the right lower second premolar. You will note that the left lower second premolar is

absent (Fig. 9*c*). On account of this condition the operator decided to retain the temporary molar.

The case was treated by the use of molar clamp bands, spurred plain bands and the expansion arch, just as we all have treated cases so easily and satisfactorily for so long. But something more than the usual appliance was needed, as you will see by the radiogram (Fig. 10) made after the left upper canine crown had been brought down into place, but leaving the root with a mesio-lingual inclination. The left lateral and central incisors had been moved to the full limit of the possibilities of the old appliance, the lateral root still having a pronounced disto-labial inclination, while the central

Fig. 9*a*

Fig. 9*b*.

Fig. 9*c*.

root pointed in a disto-lingual direction. The apices of the roots forming a pyramid.

The operator constructed a crude appliance for tipping the root of the left central to an upright position. This was accomplished and the teeth retained, but as the lateral incisor and canine had been left with the roots slanting, as just described, and as normal cellular activity which would have produced bone growth had not been stimulated, the incisors relapsed and assumed positions even more abnormal than the original condition, as shown by Fig. 11.

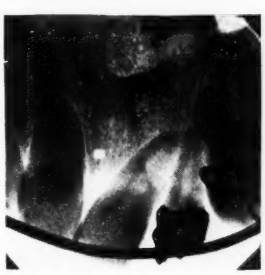


Fig. 10.

Such an unfortunate condition was quite discouraging to both the operator and patient, but fortunately the first form of Dr. Angle's new appliance, as described in the *Dental Cosmos* of March, 1910, had been used by the writer for moving incisor roots labially, with satisfactory results, so an appliance of this form was constructed to move the roots of the left incisors and canine. Adjustments were made for two months, when the family of the young lady suddenly decided to visit Europe. The patient was referred to Dr. Grünberg in Berlin but visited him for only one adjustment.

Returning to Denver after an absence of one and one-half years, the position of the three teeth was found to be nearly normal (Fig. 12) as shown by this radiogram. As the other central was slanting towards the right, a band carrying tube was adjusted and a pin to engage the tube attached to the arch; then pressure was applied to move the tooth to normal position.

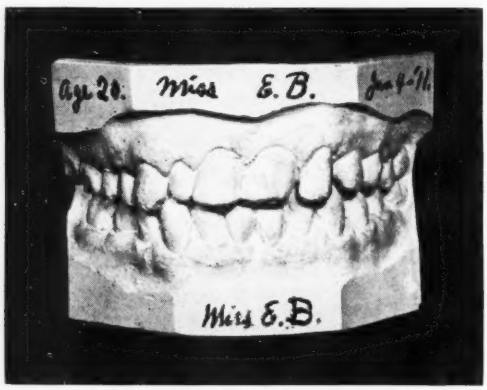


Fig. 11.

Fig. 12.

Fig. 13.

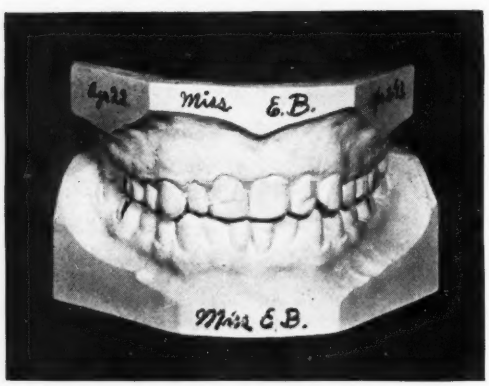


Fig. 14.

The next radiogram (Fig. 13) shows the positions of the roots of these teeth six months later.

The retainer was then applied. It consisted of bands upon the upper central and left lateral incisors with a lingual wire of the same metal as the arch wire, viz.: Angle's gold platinum retaining wire, .030″ diameter; the

posterior ends of this wire were soldered to bands placed upon the teeth which had been used for anchorage, and the left lateral incisor band was soldered directly to the wire. The left central incisor band carried an Angle retaining tube to fit .030″ wire upon the lingual side; the right central incisor band was soldered directly to the lingual wire. This makes the retainer as strong as the root-moving appliance and should preclude the possibility of a relapse. The models of the case are shown by the slide Fig. 14 as the case appeared at the three stages of treatment.

This case well illustrates the safety and accuracy of tooth movement with the new appliance, when extending over a long period of time, for after one and one-half years' absence with but one adjustment in that time, the young lady returned with the appliance intact and working perfectly. The teeth were clean; there was no caries, the gums around the upper teeth

Fig. 15.

were normal, while around the necks of some of the lower teeth, where there was no appliance, serumal deposits were present, but the tissues responded quickly to prophylactic treatment.

The writer would suggest that the best plan to acquire skill in the use of the new appliance, is to place it upon simple cases first, such as those which need after-treatment, especially those which need further bone development and the moving of tooth-roots into normal inclination. Such a case is illustrated by Fig. 15, where the appliance was used to gain space for erupting canines and to change the inclination of the lateral incisor roots to normal. Then, remember that a tooth is loosened much more through bodily movement than by tipping, as with the old forms of appliances, so it is best not to move teeth as rapidly as has been our custom. In the average case one adjustment a month—by removing the middle arch section and straightening one or two bends slightly—is sufficient, though this is too often in some cases.

In conclusion the statement can be safely made that if the skillful orthodontist, who has not used this appliance, will master its application and use, he will find new pleasure in performing difficult operations and will give his patients the highest quality of service. The writer has used the new appliance upon forty cases, comprising a fair representation from each of the three principal classes of malocclusion, and like the few orthodontists who have had the opportunity to try out this method thoroughly, is so imbued

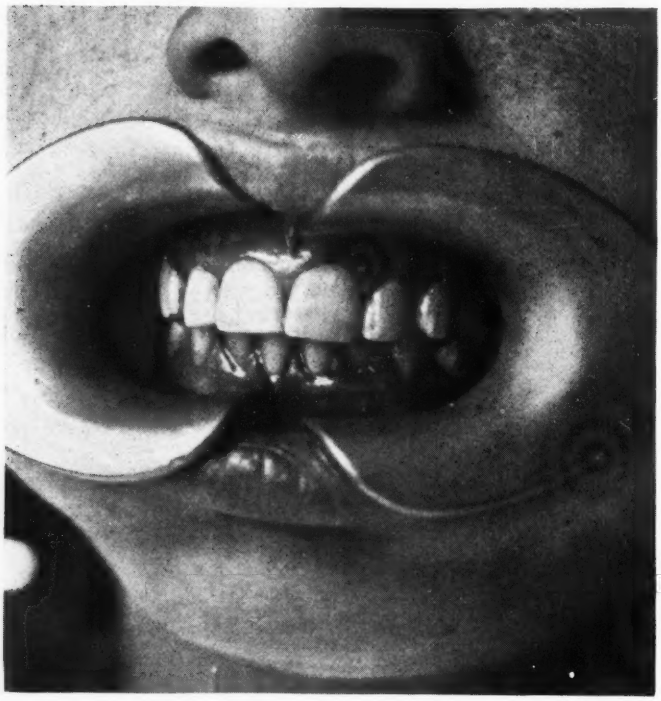


Fig. 16.—Same case as illustrated in Figs. 1 to 6 inclusive, showing condition of the teeth as they are today; photograph made August 5, 1915.

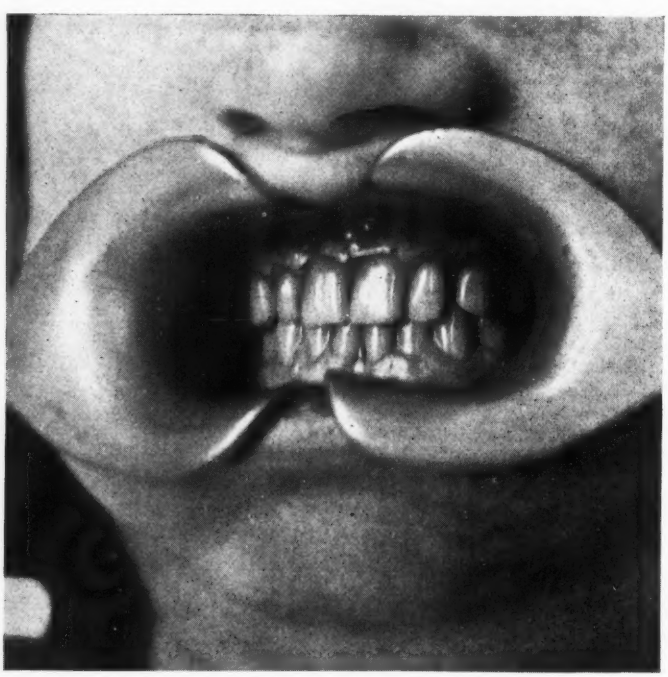


Fig. 17.—Same case as shown in Figs. 7 to 14 inclusive; photograph made August 3, 1915.

with its many advantages over the older methods, that he is now placing it upon all of his new cases, confident that with far less inconvenience to the patient, with appointments much farther apart, consuming less of the patient's time, the very best possible results in orthodontic treatment may be obtained.

THE CONSIDERATION OF CONSTITUTIONAL DISORDERS AS AN ETIOLOGIC FACTOR OF MALOCCLUSION OF THE TEETH IN CHILDREN.

By James D. McCoy, D.D.S., Los Angeles, Cal.
Professor of Orthodontia and Radiography, College of Dentistry, University of Southern California.

THAT constitutional disorders in children play an important rôle in the etiology of malocclusion of the teeth, will be received by many, it is believed, *cum grano salis*. Nearly all authors of modern text books and writers on orthodontia mention only briefly and attach but slight significance to these conditions. On the other hand, mechanical and functional causes, most of which operate during, or just preceding, the eruptive period of the permanent teeth, are held responsible for the majority of the deformities which are referred to the orthodontist for treatment.

By those who regard orthodontic treatment in the light of a purely mechanical procedure, etiology is relegated to a position of secondary importance, the treatment being aimed at the correction of all local conditions, in order to make possible along normal lines the mechanics of occlusion, respiration, etc. However, to the thoughtful and scientific orthodontist, the fact that in a certain percentage of cases even where the most careful treatment and retention have been carried out, failure in some degree ensues, must lead him to the conclusion that there is as yet a vast amount of information to be gathered concerning the etiology of malocclusion.

Medical literature contains abundant testimony to the effect that all parts of the body are liable to abnormalities of development from various and numerous causes. We fully realize that the dental structures are perhaps more prone to be at variance with the normal than almost any other, as is evinced by the fact that malocclusion of the teeth in some degree is the rule rather than the exception.

In considering this fact we should remember that the dental apparatus is not to be considered as being a single organ with but one function, but as a very complex structure with many functions, into which enter not only the jaws, dental arches and teeth, but also the muscles of mastication, the lips, nasal passages, accessory sinuses, palate and throat, and that in addition to the function of mastication and deglutition, these organs are also concerned in the functions of respiration, vocalization, etc.

The associated organs and structures entering into the performance of these various functions and acts are so intimately associated, that any disturbance in the nutrition, metabolism, or function of one part may affect or involve the whole apparatus. This is especially the case during the first few years of the child's life when all these structures are undergoing rapid change. Therefore, regardless of what the cause may be, anything which upsets the metabolism of one or more of the parts or of one or more of the tissues composing them, will be reflected in varying degrees of intensity, upon the developing occlusion of the teeth, just as mutilation in the dental arches must affect the surrounding parts.

*Read before the Pacific Coast Society of Orthodontists, San Francisco, Cal., Feb. 22-23-25, 1915.

In considering constitutional disorders which might be active in interfering with the progress of development in the dental apparatus, it is but natural to consider primarily those conditions which are injurious to the tissues which enter into the formation of the structures concerned.

We find that in the dental apparatus, as we are considering it, we have all the principal tissues which are found in the other parts of the skeleton, i.e., epithelium, the connective tissues, muscular and nervous tissues. Therefore, we have no reason to assume that these tissues as they are associated in the dental apparatus are any less subject to the effects of constitutional disturbances than they are in other parts of the body. Until physiology and pathology become more of an "open book" to us than they are now, we will be at a loss to account for certain arrestments in development occurring not only in our field of endeavor but also in the human organism as a whole.

There is enough evidence, however, to lead us to think that certain diseases have an important bearing upon development, or more properly speaking, upon arrestments of development. These conditions will be enumerated briefly under separate headings as follows:

1. The ordinary diseases of childhood which are accompanied with high temperature.
2. Congenital or Heredo-Syphilis.
3. Rickets.
4. Diseases of the Internal Secretory Organs.

Diseases of Childhood.

It is a clinically established fact that all diseases of childhood which are accompanied with high temperature, such as scarlet fever, measles, chicken pox, etc., exert a very deleterious effect upon the epithelial structures. The evidence of the pre-existence of these diseases is present in the mouths of many children coming under our observation who present teeth in which the enamel organs underwent either atrophy or arrest in development to the extent that the teeth affected are faulty in shape, size and structure.

The fact that these disturbances only leave a visible imprint upon the developing enamel (and they do not always do that) which, as one of the fixed products of epithelial origin has no reparative power, is no reason for not thinking that an equal amount of disturbance has also taken place in the cell metabolism of the other structures, resulting in arrestment of development to some degree. The so-called diseases of childhood are not effective in disturbing the process of development and eruption of the deciduous teeth, for children are not susceptible to them until after the deciduous dentition is well advanced or completed. However, during the period when most of the permanent teeth are undergoing root development which must eventually, if not interfered with, result in their eruption, these diseases are capable of producing the greatest amount of damage. It has been claimed that these diseases can produce inflammatory conditions in and about the jaws, which will result in a change in the character of the cancellated bone surrounding the teeth, through the undue stimulation of the bone building cells. As a result, the cancellated tissue may be filled up or converted into a substance resembling cortical bone. As a result of such a process, the

eruption of the teeth is retarded, and in some instances where the condition is exaggerated over certain areas, one or more teeth may be held in impaction. Teeth prevented by these secondary deposits within the cancellated bone from erupting at their normal time will—when the eruptive forces finally overcome the resistance offered them—be pushed in the direction of least resistance which oftentimes carries them far from their intended positions.

According to several reliable authors, these diseases also have an important bearing upon hypertrophy of the pharyngeal and faucial tonsils, but as we are conversant with the resultant ill effects of these conditions in our work, they need not be discussed at this time.

The fact that constitutional disturbances often register their preexistence upon a group of teeth by affecting an atrophy of the enamel organ, to the extent that the crowns of the teeth are faulty in shape, size and structure, is an important index in determining first, the time at which the structures were subjected to the deleterious effect of the disease, and second, the probable character of the cause.

At birth, calcification of the crowns of the deciduous teeth is well advanced, and the crown of the permanent first molar has also begun to calcify. Therefore any hypoplastic enamel upon the deciduous teeth would be produced during intra-uterine life. Likewise, the first permanent molars would be subject to the effects of any disturbance occurring after the twenty-fifth week of intra-uterine life or before the third or fourth year after birth.

It would seem then that where these last named teeth (the deciduous teeth and the first permanent molars) are affected, the arrestment of development could hardly be said to come from such diseases as scarlet fever, measles, chicken pox, etc., which rarely occur so early in the life of the child, but must be attributed either to some prenatal shock or to heredo-syphilis.

Heredo-Syphilis.

According to Stein "some forms of hypoplasia of the teeth are certainly syphilitic, others may be attributed to syphilis, and others are certainly not caused by syphilis." He further states that these stigmata upon the teeth can be produced only during the development of the teeth, and are the results of some interruption in the process of calcification. These stigmata may appear on any part of the teeth from the dorsal surface to the gingival margin, depending upon the time when the morbid influence of the disease was sufficient to produce them. The first permanent molars, incisors and cuspid teeth are named by him as being the ones most frequently showing the effects of the disease, as the first molars are beginning to undergo dentification during the last months of fetal life, and the incisors and cuspids during the first three or four months after birth, during which period the process of the disease is usually most intense. To heredo-syphilis is attributed the absence of one of more of the permanent teeth, implying the nonformation, or complete arrest in development of the dental germ.

Amorphism of the teeth, that is, teeth with crowns somewhat resembling sharks' teeth, twisted teeth, peg-shaped teeth, uni-, or tri-horned teeth, are also attributed to this cause, and some medical authorities on syphilis even attribute the "open bite" and asymmetrical maxillæ to this source.

Without depreciating the extent of the morbid results of this disease, our knowledge of the forces of occlusion would hardly allow us to accept this as a reasonable explanation of these two last named conditions of the dental apparatus, the open bite and asymmetrical maxillæ. It is possible that the disease can, through the unbalancing of the forces of occlusion, make these conditions possible, or that which is not unlikely, the cases in question were also afflicted with rickets.

Rickets.

Rickets is a disease of malnutrition, characterized by faulty bone formation. This disturbance of metabolism in which calcium plays a very important rôle, occurs most frequently between the ages of six and eighteen months. Occurring at a time when the growth of bone is so rapid, its effects are very striking and serious.

Normally, bone contains about 1/3 organic and 2/3 inorganic matter. In marked cases of rickets the proportions are reversed, the bones often containing twice as much organic as inorganic matter. Characteristic changes in form are seen, particularly in the long bones, but all bones are affected to some degree and it is only reasonable to expect deformity in bones subject to muscular stress, as for instance the maxillæ. Rachitic bone does not offer sufficient and proper support for the teeth to withstand the positive force of the muscles of mastication, and as a result deformity to some degree nearly always ensues.

According to Holt, the active process of rickets may persist until after the second year and may cover a period of from three to fifteen months. After its termination the bones become less vascular, and a rapid formation of bone takes place in the normal way. He also states that in addition there is in some places a direct transformation of cartilage into bone, and furthermore that the spongy masses of bone become contracted and condensed. As a result of this, the involved bone may become even harder than it normally should be, and its structure never is quite like that of normal, healthy bone.

As a rule, dentition is late and apt to be difficult (Holt). A study of the progress of dentition in one hundred and fifty rachitic children gave the following results—in 50%, the first teeth were cut on or before the eighth month; 20% of the cases had no teeth at twelve months and in 8% none had appeared at fifteen months. Even though the first teeth appearing come at the usual time, the progress of the balance of the teeth to erupt is usually retarded upon the development of rickets. The character of the teeth in rickets is usually good, which is in striking contrast to what they are in heredo-syphilis. Cases of malocclusion where rickets has been a factor can almost be said to be typical. There is a general narrowing of the maxillæ and a widening of the mandible in the region of the molars extending backward. The lower portion of the mandible is turned outward and the teeth are turned inward, as a result of the force exerted upon them by the opposing teeth above and the muscular stress from below. Considering the fact that in rachitic children the deciduous teeth erupt late and are often shed prematurely, coupled with the fact that the permanent teeth are often retarded in the process of eruption, it is not to be wondered at that a sadly deformed occlusion of the teeth is the result.

In considering the effects of the diseases thus far discussed, we must take into consideration some specific physiological factors not yet mentioned, i.e., the internal secretory organs and their relation to bodily development and nutrition. These glands, the principal of which are the pituitary, the adrenals, the thyroid, the parathyroids, the thymus, the testes, and the ovaries, are supposed to preside, by virtue of their secretions, or in some cryptic manner over certain correlations of the body. It has been claimed for these tissues and glands, that they are co-operative with or compensate and inhibit each other in cycle, and that any interfering influence or disease which disturbs this co-ordination seriously and very diversely affects nutrition, bodily development, and functions.

The Pituitary Gland.

It is situated at the base of the brain, and is composed of two lobes, the anterior and posterior, each of which has a different function. The anterior lobe presides directly over the growth of the bones. An over-secretion of this gland in a developing child, produces giantism, while a deficiency in its secretion results in dwarfism. Over-secretion from his gland in adults produces a condition known as acromegaly, in which there is an enlargement of the extremities, the head, nose, hands and feet, as well as changes in the nervous system. The posterior lobe of this gland also presides over many important phases of metabolism and nutrition, as do also the adrenals, but they do not bear any direct relationship to bone development and growth which the pituitary and thyroid have.

The Thyroid Gland.

The thyroid gland, which is situated as you know in the anterior part of the neck, is the organ of the body supposed to be the most active in the destruction of poisons, although this function is also shared by the pituitary and the adrenals. It is also concerned with the pituitary in controlling the growth of the bones, and deficient thyroid secretion in developing children, results in cretinism in some degree.

The fact that these glands are concerned in safeguarding the body against poisons, makes them important to us in a discussion of this kind, for when a developing child is suffering from an infectious disease, these glands must become extremely active. If they become exhausted in their struggle, their function is disturbed, with the result that for the time at least their secretions may be deficient. The other glands named also have a bearing upon the development and maintenance of the equilibrium of bodily growth and health, but the limits of this article do not permit of further discussion.

Grieves states that it can now be accepted as proven that the cycle of the internal secretory organs absolutely controls the formation of the facial bones, nasal and post nasal, as well as the teeth and their eruption, and emphasizes the importance of the thyroid. Hasting Gilford attaches great importance to these structures in their relation to development, but states that: "The adjusting mechanism of development is not flexible, but more or less reciprocal; so that a ductless gland both influences development and is itself changed by general development." He also places emphasis on the

importance of the thyroid. We also realize that the maxillæ can be greatly assisted in development by modern orthodontic treatment, and that the establishment of a normal occlusion and the subsequent use of the teeth are necessary factors in overcoming these arrestments in development. We must likewise come to a fuller realization that other factors must be considered, i.e., the cell metabolism of the bones in question, and the causes which may prevent that metabolism from being normal.

There is every reason why the orthodontist should be as thoroughly schooled in the basic principles of physiology and pathology as any other surgeon who devotes his energies to the field of orthopedics.

Failures in retention bear eloquent witness of this fact, although I would not mean to imply by such a statement that all failures or even the majority are due to faulty bone metabolism, but no observing orthodontist of experience can with reason deny the fact that in the past some failures have resulted for which there seemed no explanation. Is it unreasonable to assume that in these cases the calcium metabolism of the maxillæ was deficient, and as a result the teeth were not offered the support necessary to withstand the positive forces incident to occlusion?

It should be plain to anyone that such cases as those under discussion would require a much longer period of retention than the ordinary case of malocclusion, which is the result of purely mechanical causes. Furthermore, that in such cases our obligations will not be fulfilled unless we invoke the aid of a competent internist who can do much toward overcoming the ill effects in metabolism of the diseases which we have discussed from the standpoint of contributing factors.

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Edward H. Angle, "Malocclusion of the Teeth".

News and Notes.

Doctor Ira Burton Stilson announces his removal to 164 Angell Street, Providence, Rhode Island. Practice limited to orthodontia.

* * * *

Dr. F. S. Stilwell announces the removal of his office to 1010 Union Central Building, Fourth and Vine Streets, Cincinnati, Ohio. Orthodontia exclusively.

* * * *

Dr. T. Wallace Sorrels has announced his location at 516 Colcord Building, Oklahoma City, Oklahoma, for the practice of orthodontia exclusively.

EXCERPTS

Normal Occlusion the Basis of the Practice of Dentistry.—L. M. Waugh, D.D.S. (*Dental Cosmos*, August, 1915), acting in the capacity of correspondent of the Dental Society of the State of New York, reports the results of some fifteen questions sent to members of the profession who had shown interest in advanced methods of practice, together with instructors in the colleges constituting the membership of the American Institute of Dental Teachers. The questions sent to 260 practitioners follow:

(1) Do you recognize normal occlusion as the basis of all branches of dental practice?

(2) Do you consider the full complement of natural teeth or their anatomic duplicates as essential to normal occlusion?

(3) Do you consider the making of "study models" for diagnosis and outlining of treatment as being essential to the most efficient dentistry?

(4) What percentage of so-called pyorrhea do you consider to have had its inception in malocclusion? (This implies also defective approximal contacts.)

(5) Do you recognize a gradual retrogressive change as taking place in the relations of the teeth and arches when in malocclusion?

(6) Do you consider this change to reach the minimum in proportion as the occlusion approaches normal?

(7) Do you believe it best to zealously conserve the third molars that have erupted and taken practically normal positions?

(8) Give briefly your reasons for your answer to No. 7.

(9) In cases where teeth have been extracted and the adjoining teeth have partly closed-in the space, do you consider it best "as a principle" to move the adjoining teeth into their normal positions before placing an artificial substitute?

(10) If not, why?

(11) What means do you employ for producing anatomic occlusion in small areas, as in a single crown, and in bridge work?

(12) In making full dentures, do you consider the establishment of the correct position of the models to the point of motion in the articulator as essential to the most efficient results?

(13) Do you regard the use of the face-bow or some one of its modifications as essential to this?

(14) Do you consider the reproduction of the marginal, triangular, and oblique ridges, together with well-defined angular grooves and sulci, as an essential factor in restoring efficient occlusion?

(15) Do you consider that in the restoration of lost occlusal areas an accurate anatomic counterpart is necessary to the retention of teeth that have been moved into normal occlusion?

Replies were received from 141 dentists, practicing in twenty-two states and in four provinces of Canada. Answers were sent in by 100 teachers in forty-one of the forty-seven colleges comprising the most recently published membership of the Institute. Therefore the report includes opinions of teachers in all but eight of the dental schools, and in addition that of 41 practitioners who are not associated with dental faculties. It would seem that this should serve as quite a representative expression.

Waugh summarizes his conclusion as follows:

(1) Normal occlusion is the basis of the practice of dentistry.

(2) The full complement of natural teeth or their anatomic duplicates is essential to normal occlusion.

(3) Study models are essential to most efficient dentistry—(*a*) When considerable areas of occlusion have to be restored. (*b*) When malposed teeth have to be moved into normal position. (*c*) Models for study and record should invariably be made when there is the least doubt as to the proper procedure.

(4) Malocclusion is the most important causative factor in so-called pyorrhea, and conversely, pyorrhea seldom is to be found when the teeth are in normal occlusion and in proper use.

(5) A gradual retrogressive change is taking place in the teeth and arches when in malocclusion. The rapidity and degree of this change will vary greatly in different

individuals according to histological constituents, but it always takes place in some degree.

(6) The retrogressive change which takes place in the relations of the teeth and arches reaches the minimum in proportion as the occlusion approaches normal. When the teeth are in normal occlusion there should be no change other than that which is inevitable and is expressed in the term "old-age tendency of the human body," except in rare cases of grave constitutional origin.

(7) The third molar should be zealously conserved when in occlusion and it may be maintained in a state of health.

(8) Third molars when in normal healthy relations serve—(*a*) For the purpose of maintaining tight approximal contacts. This becomes progressively more necessary with advance of years. (*b*) To afford greater masticating surface in themselves and to increase the collective crushing force of the teeth. (*c*) For normal development and harmonious contour of the face. (*d*) For abutments if needed later. (*e*) For the protection of supporting structure about the second molar.

(9)—(*a*) "As a principle" governing best practice, it is imperative that, in youth, teeth that have drifted because of the loss of an adjoining tooth be moved into normal position prior to the placing of an artificial substitute. (*b*) In middle life and with advance of age, each case more and more becomes a law unto itself, but when efficient and artistic demands dictate, it should be done, except with invalids and the aged.

(11) The Oscillating Bite as a means of producing anatomic occlusion in limited areas, as given by the writer in a clinic before this society at the previous two meetings, has not been generally understood. Therefore and because a description of this method has not appeared in print, the technique will be given as the concluding part of this report.

(12) In making full dentures it is essential to the most efficient result that the correct position of the models to the point of motion be established in the antagonizor.

(13) The Snow face-bow or some one of its modifications is essential to the establishment of the correct position of the models to the point of motion in the antagonizor.

(14)—(*a*) The reproduction of marginal, triangular, and oblique ridges *in harmony with those in the mouth*, together with properly placed contact points and well-defined angular grooves and sulci, is essential in restoring most efficient occlusion. (*b*) In making artificial dentures the reproduction of these anatomic features is also essential to most efficient results.

(15) In the restoration of lost occlusal areas, an accurate anatomic counterpart is necessary to the retention of teeth that have been place in normal occlusion.

Chronic Infection of the Tonsils.—In an interesting paper by Dr. W. B. Dillingham of Halstead, Kansas, published in the June, 1915, issue of *The Medical Summary, Philadelphia*, he discussed in full the chronic infection of the tonsils and its relation to systemic disease and cure by radical operation.

The faucial tonsils are globular masses of lymphoid tissue lying one on either side of the fauces, in a recess (the sinus tonsillaris) which is formed by the palatal arches.

A tonsil is the largest of the lymphoid nodules of the respiratory and alimentary tracts and differs from other such nodules only in its size, its compactness, and in the extent and complexity of its crypts. It has an internal surface, an anterior, a posterior and a superior border, and a superior and and inferior pole. It is originally developed in two lobes, a lower and an upper, which become fused shortly before birth.

It is attached to the walls of the sinus tonsillaris by a root which includes a variable portion of its outer surfaces and of its anterior and posterior borders. This attached surface is covered by a fibrous membrane, the capsule, which is continuous with the fibrous mucosa of the surrounding mucous membrane. It presents on its epithelial surface the openings of from ten to twenty pits or crypts, which extend deeply into its substance practically as far as the capsule.

The sinus tonsillaris, the walls of which surround the tonsil on all but its inner side, is a triangular depression bounded anteriorly by the anterior faucial pillar (palatoglossus muscle), posteriorly by the posterior faucial pillar (palato-pharyngeus muscle), superiorly by the tissues of the soft palate, and externally by the superior constrictor muscle of the pharynx. It is deep above,

where it may end at the apex formed by the junction of the pillars; or it may extend considerably above this point into the tissues of the soft palate, which form a dome-shaped matrix for the superior pole of the tonsil, surrounding it like a hood.

The supratonsillar fossae lies between the superior pole of the tonsil and the superior angle of the sinus. It is constant. It may be a distinct space, triangular in shape, with its faucial opening more or less completely covered by the upper segment of the plicae which at this point is sometimes called the plicae supratonsillaris.

When the sinus extends high into the palate, the superior lobe of the tonsil pushes its way into this superior cavity and the supratonsillar fossae is reduced to a blind epithelial sac with walls in apposition. It may be very extensive, often admitting a probe as far as the plane of the external surface of the tonsil. A variable amount of lymphoid tissue is developed in its superior wall.

The crypts may be single and without noticeable change in caliber throughout their length, or they may be extensively branched and their caliber much greater below the surface than their faucial openings would indicate. The accumulation of cellular debris within them is so frequent that a mild degree of the irregular pocketing results. The crypts extend in a general outward direction. Those that empty into the supratonsillar fossae extend downward and outward. These latter drain poorly, both on account of their direction and because of the closed condition of the fossa.

The capsule covers all surfaces of the tonsil not covered by epithelium. Theoretically it includes only that part of the deeper layers of the fibrous mucosa of the sinus that covers the attached surface of the main bud of the tonsil. As the mucosa of the more internal surfaces of the sinus, including the plicae, have lymphoid nodules developed in them often directly continuous at the root of the tonsil with the lymphoid tissue of the main mass, it seems best to consider the capsule as including the fibrous mucosa of the entire sinus, even to the internal rim of the plicae. At this point it is folded upon itself and becomes the propria of the faucial mucosa.

It will be appreciated from the above description that the tonsil lies in and not under the mucosal membrane; that it is in reality simply a complicated mucous membrane with lymphoid nodules developed in the more superficial fibers of its tunica propria. If this fact is kept in mind the relations of its various parts to each other and to the surrounding tissues are easily understood.

The Blood Supply of the Tonsils.—The Arteries.—The tonsil is an extremely vascular organ, receiving its blood supply from the tonsillar and palatine branches of the facial, from the descending palatine branch of the internal maxillary, from the dorsalis linguae of the lingual and from the ascending pharyngeal. Its chief blood supply is from the tonsillar and ascending palatine branches of the facial. These branches pierce the superior constrictor opposite the lower pole of the tonsil, ascend for a variable distance on the external capsular surface and enter the tonsil in its lower half. They are the most important arteries of the tonsil from the surgical standpoint, as they are the ones most often involved in post-operative bleeding.

This splitting, no doubt, is due in part to the action of saprophytic or pathogenic micro-organisms on the tissue of the tonsil. It is not improbable, however, that part of this splitting action may be due also to the action of a ferment for tonsillar tissue contained in the blood, and which resembles an amboceptor and requires complement to complete its action. It is plausible to assume that local death of tonsillar tissue by the action of organisms, like the streptococcus, permits of the parenteral absorption of tonsil protein and results in the formation of an amboceptor for this protein which, with the aid of the complement, is capable of splitting the protein. This splitting action, then, might occur either *in loco* or following the parenteral absorption of tonsil protein in the circulating blood. The toxic action of tonsillar products may then, in part at least, be responsible for many of the clinical symptons manifested in the course of disease of the tonsils. The individual becoming sensitized to his tonsils exhibits from time to time mild or severe symptoms due to the toxic products of tonsillar origin.

Sensitization.—The effect on the individual of continued sensitization in this manner can only be speculated upon. Longcope has been able to procure an interstitial hepatitis somewhat resembling a cirrhosis, a myocarditis with scar formation and a glomerular and a parenchy-

matous nephritis in rabbits, cats, guinea-pigs and dogs by repeated sensitization with proteins. The frequency with which myocardial and renal lesions are found accompanying and following acute and chronic tonsillar conditions has long been known. These secondary conditions may have been attributed usually to a systemic bacterial invasion with the tonsil as the atrium. This, no doubt, is in most cases the predominant etiological factor. It does not seem improbable, however, that some of these conditions may be due, in part at least, to toxic protein products of tonsillar source.

Such conditions as asthma, convulsions, and even true epilepsy may be produced through the agency of the toxic products of the human tonsil.

The veins of the tonsil form a plexus lying in the walls of the sinus. The largest vessel of the plexus runs down the outer edge of the palato-pharyngeus muscle and joins with veins from the epiglottis and the base of the tongue, forming a large trunk which empties into the pharyngeal plexus. A smaller vein runs down the anterior wall and empties into the lingual veins.

The Nerve Supply of the Tonsils.—The nerve supply of the tonsils is derived from the spheno-palatine or Meckel's ganglion through the middle and posterior palatine nerves, and from the glosso-pharyngeal. Fibers from these two sources unite to form a plexus around the tonsil (circulus tonsillaris.)

The Lymphatics.—There are two principal retro-pharyngeal glands, one on each side of the median raphe, at the junction of the posterior and lateral surfaces of the pharynx, corresponding to the situation of the arch of the soft palate, with sometimes three or more additional lymph nodes on one side or the other. These glands correspond to the general situation of retro-pharyngeal abscesses, these being invariably found on one or the other side of the median line. They receive the lymph coming from the mucous membrane of the nasal fossae, and adjacent cavities, and drain into the upper glands of the internal jugular chain, passing behind the vessels and the nerves. The general lymphatic drainage of the pharynx ends either in the retro-pharyngeal glands or the internal jugular chain. The glands of this chain also receive the lymph from the internal group of the sterno-mastoid glands. The lymphatics from the tonsil appear to drain into the posterior lymph glands of the tongue, thence into two lateral trunks, thence passing down the lateral walls of the pharynx terminating in large glands of the internal jugular chain behind the posterior belly of the digastric. This is the principal meeting place of the neck lymphatics. A not inconsiderable number of the lymph vessels go directly from the posterior pharyngeal wall to the deep glands of the neck and the jugular region.

The Relations of the Tonsil.—The tonsil is so placed that its posterior-inferior limits are just in front of and above the angle of the jaw. It can never be felt on the outside except in cases of malignant growth.

Inferiorly the tonsil is in relation with the base of the tongue and the lingual tonsil, from which it may be separated by the lower segment of an extensive plicae triangularis; otherwise the two lymphoid masses may be directly contiguous. Superiorly the tonsil is in relation with the soft palate, into which it may mound considerably above the junction of the pillars. Externally the tonsil lies directly on the superior constrictor muscle of the pharynx, to which it is but loosely attached except at its lower pole where its larger vessels enter. Between the two there is a theoretical space, in which abscess formation often takes place (peritonsillar abscess). External to the superior constrictor is the pharyngo-maxillary space. It is filled with fat and areolar tissue continuous with that of the carotid sheath.

The internal carotid artery lies two cm. (4/5 in.) behind and external to the posterior pillar.

Types of Streptococci Found in Tonsillar Crypts.—(1) The streptococcus hemolyticus, which on blood agar produces a clear zone of hemolysis about the colony, appears in chains of round or slightly oval cocci. This is the type most constantly found in erysipelas, complications of scarlet fever, and various suppurative processes of streptococcus origin, especially of peritonsillar abscess.

(2) Streptococcus viridans which on blood agar develops a very small gray colony surrounded by a zone of green, and which in smears occurs in pairs which resemble pneumococci, or in short and long chains of cocci arranged in pairs. The streptococcus viridans is usually without capsule and is the chief etiological factor in infections of endothelial and mucous surface. It is by far the commonest mi-

cro-organism found in infected tonsils, both acute and chronic.

(3) The streptococcus mucosis which on blood agar produces delicate, colorless, transparent, glistening drops of a mucoid consistency and which appears in chains of diplococci surrounded by a thick capsule with no indentation between the pairs.

Toxic Products of the Tonsils.—The hemolytic streptococcus is present in tonsils, the extracts of which are most toxic, and it is logical that the extracts' toxicity must depend in part on toxic products elaborated out of the streptococcus itself, or by the action of the streptococcus on the tissue in which it is growing; or that both hypotheses may be true.

The tonsils, the extracts of which are most toxic, contain a considerable amount of heat non-coagulable biuret-reacting substance or substances, in all probability a product of the splitting of proteins *in loco.*

The Jaws, the Teeth and the General Practitioner of Medicine.—The time has not long passed when the general practitioner had no interest in the condition of the jaws and teeth of his patient, save that occasionally he was called upon to remove with forceps a troublesome molar. With the advance in our knowledge concerning the causes of many diseases, and with our constantly increasing information as to the means by which bacteria find their way into the tissues of the body, we are now on the lookout for septic foci, and in a very large proportion of cases find them about the teeth, in the form of a pyorrhea alveolaris, and sometimes in the tonsils. From these two centers of infection micro-organisms gain access to the circulation or to the lymph channels, and, being carried to other parts of the body, induce arthritis, infections of the kidney and bladder of the endocardium, and sometimes of the pleura. Recently we have seen several cases in which the presence of pus about the roots of the teeth has resulted in serious and prolonged illness, with all the manifestations of septicemia.

Not only may general systemic infection arise from these causes, but the swallowing of germ-laden saliva, or foods so contaminated, result in an infectious catarrh of the stomach and intestine and possibly induce inflammatory changes in the mucous membrane of the common bile duct and finally of the gall-bladder. It is of vital importance, therefore, that in investigating an obscure case of fever and arthritis the condition of the oral cavity be carefully looked into, that the dental surgeon shall be called in consultation to discover and remove the foci of infection, and that the expert with the X-rays shall also be asked to aid in the discovery of a possible cause of illness, since it not infrequently happens that by this means a septic focus at the root of a tooth is discovered.

Under these circumstances the tooth should be removed, or its surrounding tissues so treated that, with the aid of antiseptic applications, free drainage may be obtained. Frequent washings of the mouth with peroxide of hydrogen and water in the proportion of 1 to 3 should be resorted to, or in other instances a mouth-wash consisting of 10 minims of the tincture of iodine in half glass of water may be used for the same purposes. In still other instances a mouth-wash containing chlorate of potash and tincture of myrrh may be employed with advantage.

It not infrequently happens that septic foci about the teeth produce no general or local symptons until by some illness or other cause the patient's vital resistance becomes impaired, and then the micro-organisms which have been lurking about the roots of the teeth are able to induce severe illness.

In cases in which the infection is due to the ameba buccalis, hypodermic injections of emetine have proved of value.—*Therapeutic Gazette.*

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EDITORIALS

Precedents.

PRECEDENTS are the handcuffs that shackle the world. Before a judge renders an opinion, he looks for a case similar to the one he has in hand, and follows the blazed trail. The statesman, before announcing his opinion on any question of state or national importance, tries to bulwark himself behind some precedent. The chief magistrates of the earth, when answering to their constituents for any official action, start their preamble and conclude their remarks by citing such and such a precedent. The surgeon tries to bolster up his defense for daring to invade the sacred fields of life by what his predecessors in the healing art have undertaken and accomplished.

It would be an easy matter to cite examples without number to show that the above statement is correct. But why go farther than your own open door? Precedent binds you to the chariot wheel of mediocrity. The few daring souls on earth who scorn precedent as the soaring eagle scorns the ground, usually are dubbed cranks, raving maniacs, or fools.

And, after all, who makes or sets precedents? An accident today may be a precedent for the world tomorrow. This is the day of men, not Gods and devils. Cannibalism has faded from the landscape of your life and

mine. Star chambers, thumb-screws, pillories, the faggot and crucifixion have long since been discarded. Then why should you look for precedents when you want to act? Why not act? Why not hurl the thunderbolt of our life wherever we please so long as we have due respect for the rights of others? Why warp our opinions to fit the garment cut by one who has grown old and hoary in his fight with time?

And are precedents always right? If so, who makes them thus? When has man ever been infallible? In the light of this reasoning, why take as your criterion the act, the utterance, or the accomplishment of someone else? Why not set a precedent yourself? Why not dip your plumage in the blue sky? Why not break your handcuffs? Why not stand alone?

The Pin and Tube Appliance.

IN the first issue of the International Journal of Orthodontia an article was published by Dr. A. H. Ketcham on the treatment of cases with the Angle Pin and Tube Appliance. In the current number appears an exhaustive paper on the same subject by Doctor Ketcham, read before the European Orthodontic Society. No appliance used by orthodontists in recent years has aroused more discussion as to relative merits than has this one.

Doctor Ketcham is thoroughly competent to write upon this subject. He has used the appliance from the time it was first perfected and given to the profession. He has used it in a great many cases, and his experience is therefore of value. What he has to say, both for and against the use of this appliance, is the knowledge he has gained in that most instructive of all schools—experience, and as a result of a number of years work.

Progress in orthodontic art and science is made only by careful and painstaking work.

Doctor Ketcham has achieved success with the Pin and Tube Appliance because he has mastered the technique of its application and the principles underlying its usage.

It is hoped that the continued use of this appliance by orthodontists will demonstrate its value in the correction of certain types of malocclusion.

Poise.

THE best evidence of a trained mind is the ability to maintain poise. This characteristic is manifest in those individuals who have achieved the most notable and lasting success in the world's advancement, and it is no doubt true, that the extent to which we develop in this particular field, is our degree of success measured.

Instability is abhorred in the physical world. Before an engine can render service to man it must have a governor. Equilibrium must be maintained throughout the universe or chaos will reign.

How often do we hear this statement made of an individual—"He flies off at a tangent" or "When a crisis confronts him he loses his head". These expressions indicate loss of poise in the one to whom referred. The world can't depend upon individuals of this kind and puts a mark of disapproval

on their brow by keeping them bound in shackles and in misery. Fussy individuals, those who constantly lose their temper when difficulties arise, lack poise and usually, when the supreme tests in life come, are found to be a minus quantity.

Proper education means perfect poise. It stands for stability, for the maintenance of equilibrium. You can depend upon an individual who has developed these qualities. He is to the material world what the North Star is to the mariner. The compass indicating human achievement varies with poise. The needle swerves toward success in accordance with the degree of equilibrium possessed.

In the professions, especially dentistry and medicine, the man of poise is the one who wins permanent success. A fixed purpose is always essential in dealing with people where health is at stake. Like the magnet that draws from all directions, so must the dentist and physician be, who wins, and he must attract on account of his inherent power. Most people when consulting their dentist and physician like to lean upon them, and they prefer to lean on someone who is perfectly poised, who is unchangeable and who stands up solidly, like a rock in a waste of seas. To the *orthodontist*, poise is a necessity if he would become even moderately successful. Child life is marked by whims, by change of purpose, by loss of temper. To handle such patients with that degree of success necessary to get results, demands unusual poise on the part of the operator. He must become the rock in the child's stormy sea.

Perfect poise carries with it tact, cheerfulness, confidence, and inspires respect. These characteristics are necessary in handling children, and upon ones ability to handle patients depends, in a large degree, the success attained in this specialty.

Nutrition.—A Guide to Food and Dietetics.—By Charles S. Sohn, F.I.C., F.C.S., Member Cookery and Food Association, author of Dictionary of Active Principles of Plants, etc. E. B. Treat & Company, New York. Price, cloth, $1.75.

This work deals with the general principles of nutrition, takes up the chemical composition of the human body, and shows what foods are necessary for the proper growth, development and health of the body. It shows the rôles played by various foods, the different stages of digestion, giving several complete tables in regard to the value of different foods, and the proper selection of food for certain requirements. Probably no subject is of as much importance to the dentist as the question of foods and nutrition, and there is probably no subject about which the dental profession knows so little. The book is very valuable as an addition to the library, is very valuable as a guide to be followed, as it outlines the proper diet to be followed by a professional man or one who takes very little exercise. The amount of food elements obtained in each different class of foods and the amount of nutrition to be derived from different kinds of food—both meat and vegetable—are clearly explained, as is also the different effects of beverages. The volume as a whole is one which demands a great deal of study and one from which can be obtained much valuable information.

Panama-Pacific Dental Congress.

August 30th, the date on which the Panama-Pacific Dental Congress will meet in San Francisco, is near at hand. The Committee of Organization desires to anounce that the Congress will open on time with an exceptionally good program. About 130 papers and over 200 clinics are now promised for the program.

Practically all the exhibit space at the disposal of the committee is now occupied and no other Congress has had such a complete exposition of dental and pharmaceutical goods as will be presented here. Everything points to a large and successfull meeting. Nearly eleven hundred applications for membership are now on file and more are coming in daily.

The membership committee urges all who expect to attend the Congress to fill out their application blanks, have them signed by a member of the executive committee of the state in which they reside, and forward with check, draft or P.O. money order for ten dollars to the secretary, Dr. A. M. Flood, 240 Stockton St., San Francisco. This should be done as soon as possible as it will save the dentist considerable trouble and annoyance, and will facilitate the work of registration. Those who have not paid for their membership, nor have filed their applications for membership, properly endorsed, but expect to obtain membership in the Panama-Pacific Dental Congress upon reaching San Francisco, must make provision to secure proper credentials from their state or local dental society, to file with their application. Those not members of any dental society must secure the endorsement of a member of the executive committee from the state in which they reside.

Registration.—The bureau of registration will be located in the Exposition Memorial Auditorium, Grove, Larkin, Hayes and Polk Streets.

A branch post office and bureau of information will be established in connection with the registration bureau.

Members must register in order to obtain the official program and invitations to entertainments. All are urged to register as soon as they can name their hotels. The registration department will be open from 8:30 A. M. to 5:30 P. M. on Monday, August 30, 1915, and these hours will be kept each succeeding day during the Congress, as long as necessary for the accommodation of those wishing to register. Be sure to bring the membership card sent you from the San Francisco office when you paid the membership fee.

Hotel Reservations.—Although San Francisco can easily accommodate all those in attendance at the Panama-Pacific Dental Congress, members are urged to make their hotel reservations early. It will be a great comfort upon arriving in San Francisco to go at once to a hotel that is expecting you, rather than to make a round of hotels, finding a number of them completely filled and finally being compelled to take the first lodgings which can be found in a hurried personal search. Reservations may be made through the San Francisco Hotel Bureau, Kearny and Market Streets, S. F., or through the Exposition Tour Service Company, 155 Sutter Street, S. F., Cal. Take the reply you receive with you to San Francisco. Then on arriving, all you will have to do is to go to this hotel and register. In requesting a hotel res-

ervation, be sure to state your full name and home address, the date you expect to reach San Francisco, the number in your party, the number of rooms required, the rate per day per person, per room, you are willing to pay and the hotel you prefer, if any.

Mail.—You may have your mail sent to you in care of Panama-Pacific Dental Congress, Exposition Memorial Auditorium, San Francisco, Cal.

Alveolodental Pyorrhea.—By Charles C. Bass, M.D., Professor of Experimental Medicine, and Foster M. Johns, M.D., Instructor in the Laboratories of Clinical Medicine of Tulane Medical College. Octavo, 168 pp., illustrated. Price, $2.50. W. B. Saunders Company, Philadelphia and London.

This work on alveolodental pyorrhea or pyorrhea alveolaris, as known to the dental profession, is a book which sets forth the "Endamœba buccalis" as the specific cause of pyorrhea, and deals with the work done by the authors upon pyorrhea and upon Endamœba buccalis with emetin pyorrhea. Chapter I is given over to the definition of the subject while the second chapter deals with the history of the literature of the Endamœba buccalis as a factor in disease. Under the etiological consideration of the disease, the writers take the Endamœba buccalis as the specific cause. They describe the morbid process of this disease and the relation which the peridental membrane bears to the tooth and the Endamœba buccalis. The illustrations used in describing the structure of the peridental membrane could be very greatly improved on. The view which the authors hold in regard to salivary calculus is directly at variance to what the dental profession has known to be true for years. The various symptoms, as mentioned, are quite complete. Bass and Johns claim that pyorrhea is the cause of malocclusion, as opposed to the theory that malocclusion has anything to do with the production of pyorrhea. In fact, a great many of the statements in this volume will not be accepted by the dental profession, because they deal with conditions which the members of this profession know are not true. The principal treatment of the disease as described consists of the use of emetin, and those who are interested in the treatment of pyorrhea with emetin would do well to read this book. However, it is hoped that certain of the illustrations used in the present edition will be greatly improved should a second printing be called for. Owing to the complete manner in which the use of emetin is taken up, the work is a very valuable addition to any dentist's library.